Skills required for Improving Local Content Development among Mechanical Engineering Students for Industrialization of Polytechnics in Rivers State

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Abstract: The aim of this study is to investigate on the strategies for improving TVET and local content development among mechanical technology students in rivers state polytechnics. Two purposes and two research questions guided the study. Two null hypotheses which were tested at 0.05% level of significance were formulated. The study adopted a descriptive research design and was carried out in polytechnics in Rivers State. The total population for the study was 172 respondents. No sampling technique as the population is of manageable size. A questionnaire based on four point scale was used as the data collection instrument. The instrument used for data collection was a structural questionnaire. Section 2 was structured on a 4-points scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The questionnaire was validated by three experts from the Department of Industrial Technology Education, Ignatius Ajuru University of Education, Rumuolumini. Cronbach Alpha reliability method was used and Cronbach alpha of 0.78 value was obtained represent the reliability coefficient of the instrument. Findings of the study revealed that ability to: Select and use of hand tools, Perform basic, routine layout, Read and comprehend information on orthographic prints and job process sheets for routine manufacturing operations, Perform hand fitting and minor assembly are the strategies for improving TVET and local content development among mechanical technology students in rivers state polytechnics. Recommended that Government, NGOs and/or wealthy Nigerians should: Develop and improve polytechnics programs to respond to the economic needs of the country and Control foreign investment and enhance Nigerian local content.

Keywords: Skills, Local Content Development, Mechanical Technology and Polytechnics.

Introduction

The word indigenous simply means native or local. It could be used to refer to something that originates within a locality and is unique to the locality. Engineering on the other hand can be referred to the art and science of applying knowledge to meet man’s needs. Putting the two words together, indigenous Engineering can be defined as locally developed art and science that is unique to a given culture or society, which is applied to meet man’s need (Okorafor, 2014). Eionet (2012) defined local content as the technology employed by native inhabitants of a country and which constitutes an important part of its cultural heritage and should therefore be protected against exploitation by industrialized countries. World Bank (2013) acknowledged that indigenous knowledge is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management and a host of other activities in rural communities for industrialization.

The rapid industrialization of any nation is tied to acquisition of engineering skills. Fundamentally, it is a systematic way of exposing individuals to the practical training of developing and producing goods and services for the citizens’ in any country. Nigeria as a developing country has failed to achieve any meaningful industrial development because of a number of factors principal among which is overdependence on imported goods from the developed countries. The nation is endowed with abundant natural resources but lack the necessary engineering knowledge to transform these resources into finished products. Therefore, acquisition of engineering skills is imperative to attaining industrial development, for it is a type of technology that involves the application of the rudiments of science and technology for industrial design, production, distribution and services. It is on record that most
industrialized countries of the world like USA, Germany, Japan and Britain have developed through huge investment in engineering and technology. The attainment of an industrialized nation requires to a very large extent the training of the youths in various trades and professions which include air-conditioning, automotive services, aircraft maintenance, construction and maintenance trades, carpentry, electrical/electronics, fabric maintenance service, industrial atomic energy, maritime occupations, energy, metal works, metallurgy, electric power-generating plant maintenance, textile production and fabrication, leather works etc. Mechanical engineering is a type of engineering designed to develop skills in individuals to live, learn and work as productive citizens in the society (Okoro, 2006). Industrial productivity is a measure of the efficiency which involves the conversion of productive resources into commodities or products. Higher productivity is a parameter for assessing living conditions and national development. This is to say that the technological progress of any nation depends on the level of resourcefulness of her citizens which in-turn is a reflection of the quality of education.

This specialized education offered in technical institutions is saddled with training of middle level manpower, including polytechnics. Polytechnics in Nigeria are established to produce technicians at the (OND) level and (HND) level (NBTE, 2009). The curriculum programmes of polytechnics according to federal government of Nigeria (2013) are grouped into related trades. These include; the computer trades, electrical/electronic trades, civil/building trades, wood trades, and mechanical trades etc. Mechanical trade is a general name used in describing trades that have direct bearing with metal welding/forming and servicing/repairs of machines or machine related equipment and appliances, the trades in this group include agricultural implement and equipment, mechanics work, auto electrical work, auto mechanics works, auto body building, auto parts merchandising, air-conditioning and refrigeration mechanics works, welding and fabrication engineering craft practice and mechanical engineering (Amadi, Orlu & Obed, 2015).

Mechanical Engineering is one of the units that constitute the field of technology education. Mechanical engineering comprises a blend of both theory and practical that leads to the production of goods and services by the use of tools, equipment and metal-work materials. Mechanical engineering is a discipline aimed at training students on the general properties and use of metal in order to help them in materials selection for particular job, train them on how to differentiate the techniques and approaches for a specific work and teach them how to utilize the safety rules and regulations in the workshops (Amadi, Orlu & Obed, 2015). National board for technical education (NBTE, 2003), maintained that the curriculum in mechanical engineering is designed in modules which include power and plant engineering option, and manufacturing engineering.

The aim of power and plant engineering technology option according to NBTE, (2001) is designed to produce a power and plant technologist for the manufacturing, transportation and power generating industries such as PHCN/ NPA, NRC, REB. Diplomates of the programme should be able to:

a. interpret information in mechanical and technical literature and specify requirements for mechanical systems;
b. install, maintain, and repair industrial plants;
c. install, maintain, diagnose and repair power generating units such as internal combustion engines, gas and steam turbines, hydraulic and pneumatic equipment, e.g. forklift, compressors and steam boilers;
d. supervise mechanical engineering technicians, craftsmen and artisans in a manufacturing and other process and industrial plants;
e. plan and execute maintenance operations in industrial.

The programme in manufacturing engineering according to NBTE, (2001) is aimed at producing technologists with knowledge and skills for manufacturing and maintenance of the mechanical engineering and similar industries. Diplomates of the programme should be able to:

a. use and operate various machine tools and equipment in the manufacturing of engineering components.
b. understand the principles and application of manufacturing management techniques;
c. design tools and jigs and produce proto-type of such items;
d. fabricate metal products using various techniques and processes;
e. plan and carry out installation, maintenance and repair of plant, machines and equipment;
f. manage materials and human resources in the manufacturing industries at this level.

The courses offered in this options includes: metal forming and heat, foundry technology and practice, metrology, testing and failure of materials, fluid power machines, machine element design, metal joining processes and operation and application of capstan and turret lathes. The aims of mechanical technology in polytechnics can only be met if the country places more value in local technology in place of expatriates (NBTE, 2001). For Nigeria to move forward it needs its own indigenous technology
Skill is the ability to perform something well (Ogbuanuya & Bakare, 2014). A skill according to Michael (2004) is an individual’s capability to control element of behavior, thinking and feelings within specific contexts and within particular task domain. Mechanical skills involve maintaining, repairing or servicing of all kind of mechanical equipment. Graduates of mechanical engineering technology require these skills to embark on either self or paid employment in Rivers state. But these graduates as it was observed by researchers find it very difficult to maintain mechanical equipment. The employers of labour finds it difficult to employ these graduates, even when they employ them, the employers has to retrain them for months so as to equip the graduates with the required skills.

**Purpose of the Study**

The general purpose of the study is to investigate the required skills for improving local content development among mechanical engineering students in Rivers State Polytechnics. Specifically the study tends to explore the following:

1. Identify and improving the Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.
2. Improving working principles of the center lathe and it basic operations skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.

**Research Question**

Two research questions were formulated to guide the study

1. What are the areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics?
2. Identify the areas for improving working principles of the center lathe and its basic operations skills among mechanical engineering students for Industrialization in Rivers State Polytechnics?

**Hypotheses**

Two null hypotheses were formulated to guide the study and will be tested at 0.05% level of significance.

1. There is no significant difference in the mean responses of the respondents on the areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.
2. There is no significant difference in the mean responses of the respondents on the areas for improving working principles of the center lathe and its basic operations skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.

**METHODOLOGY**

This study adopted a descriptive research design and was carried out in all polytechnics in Rivers State. The total population for the study was 172 respondents. No sampling technique as the population is of manageable size. A structured questionnaire based on four point scale was used as the data collection instrument. This developed questionnaire was structured and grouped into three parts. Part 1: Seeks on personal data of the respondents. Part 2: Contains items which seek information on the areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics. Part 3: Deals with items which seek information on the areas for improving working principles of the center lathe and its basic operations skills among mechanical engineering students for Industrialization in Rivers State Polytechnics. Section 2 was structured on a 4-points scale of Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagreed (SD). The questionnaire was validated by three experts from the Department of science and Technical Education, Rivers State University of Science AND Technology. For the purpose of obtaining the internal consistency of the instrument, Cronbach Alpha reliability method was used and Cronbach alpha of 0.78 value obtained represent the reliability coefficient of the instrument.

**Method of Data Analysis**

Results were analyzed using the following: Any item with a mean value within the real limit of numbers 0-1.49 was regarded as strongly disagreed, 1.50-2.49 was regarded as disagreed, 2.50-3.49 was regarded as agreed and 3.50-4.00 was regarded as strongly agreed. T-test was used to test the Null Hypothesis of no significant difference at a 0.05 level of Significance. Any item whose P-Value is greater than 0.05 was accepted while any Item whose P-value is less than 0.05 was rejected.
RESULTS

Research Question 1: What are the areas for improving Production of simple engineering components skills among mechanical engineering students for industrialization in Rivers State Polytechnics?

Table 1: Mean and SD of Respondents on the areas for improving Production of simple engineering components on the bench operation among mechanical engineering students for Industrialization in Rivers State Polytechnics.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Description</th>
<th>X</th>
<th>SD</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select and use of hand tools</td>
<td>3.27</td>
<td>.833</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Perform basic, routine layout</td>
<td>3.12</td>
<td>.708</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>Read and comprehend information on orthographic prints and job process sheets</td>
<td>3.10</td>
<td>.930</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>Perform hand fitting and minor assembly</td>
<td>2.98</td>
<td>.905</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>Perform bench cutting tasks such as sawing, reaming, and tapping</td>
<td>3.03</td>
<td>1.035</td>
<td>A</td>
</tr>
<tr>
<td>6</td>
<td>Perform basic housekeeping responsibilities</td>
<td>3.08</td>
<td>.827</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>Describe the essential features and use of the following: micrometer, vernier caliper, Venier height gauge and combination set</td>
<td>3.09</td>
<td>.899</td>
<td>A</td>
</tr>
<tr>
<td>8</td>
<td>Perform marking out exercise on plane surfaces including profiles milling, drilling, or surface grinding machines</td>
<td>3.19</td>
<td>.934</td>
<td>A</td>
</tr>
</tbody>
</table>

Table1 revealed that item 1 - 8 had mean of 2.98-3.27. The values of the 8 items were within the real limit of numbers 2.50-3.49 indicating that the 8 items are in agreement with the items as the strategies for improving Production of simple engineering components on the bench operation among mechanical engineering students for industrialization in Rivers State Polytechnics.

Research Question 2: What are the areas for improving working principles of the center lathe and its basic operations among mechanical engineering students for Industrialization in Rivers State Polytechnics?

Table 2: Mean and SD of Respondents on the areas for improving working principles of the center lathe and its basic operations among mechanical engineering students for Industrialization in Rivers State Polytechnics.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Description</th>
<th>X</th>
<th>SD</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting up and operate a drilling machine in given situations</td>
<td>3.32</td>
<td>.828</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Change of spindle speed</td>
<td>3.06</td>
<td>.770</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>Adjustment of drilling table to required height and angle, holding of work on drilling table to required height and angle, using clamping devise</td>
<td>3.15</td>
<td>.936</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>Install up the drill bit in Chuck</td>
<td>3.18</td>
<td>.882</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>Sharpen a twist drill correctly to manufactures' specification</td>
<td>3.26</td>
<td>.859</td>
<td>A</td>
</tr>
<tr>
<td>6</td>
<td>Drilling blind holes</td>
<td>3.03</td>
<td>.908</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>Drilling round stock</td>
<td>3.27</td>
<td>.905</td>
<td>A</td>
</tr>
<tr>
<td>8</td>
<td>Counter boring and counter-sink</td>
<td>3.01</td>
<td>.930</td>
<td>A</td>
</tr>
</tbody>
</table>

Table2 revealed that item 1 - 8 had mean of 3.01-3.32. The values of the 8 items were within the real limit of numbers 2.50-3.49 indicating that the 8 items are in agreement with the items as the strategies for improving working principles of the center lathe and its basic operations among mechanical engineering students for industrialization in Rivers State Polytechnics.

Hypotheses

Hypothesis 1: There is no significant difference in the mean responses of the respondents on the areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.

Table 3: The t-test analysis of Difference between Students and Lecturers on areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics.
Data in table 3 revealed the t-test analysis of responses of mechanical engineering students and lecturers in Rivers State Polytechnics. The students and lecturers have grand means that are all greater than 0.05% level of significance. This shows that the respondents agreed that there is a significant difference in the mean responses of the respondents on the areas for improving Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers state polytechnics.

**Hypothesis 2:** There is no significant difference in the mean responses of the respondents on the areas for improving working principles of the center lathe and its basic operations among mechanical engineering students for Industrialization in Rivers State Polytechnics.

**Table 4: The t-test analysis of Difference between Students and Lecturers on areas for improving working principles of the center lathe and its basic operations among mechanical technology students for Industrialization in Rivers State Polytechnics.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Students</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to:</td>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td>1</td>
<td>change of spindle speed</td>
<td>3.4218</td>
</tr>
<tr>
<td>2</td>
<td>Adjustment of drilling table to required Students height and angle, holding of work on drilling table to required height and angle, using clamping devise</td>
<td>3.3833</td>
</tr>
<tr>
<td>3</td>
<td>Install up the drill bit in Chuck</td>
<td>3.1429</td>
</tr>
<tr>
<td>4</td>
<td>Sharpen a twist drill correctly to Students manufactures’ specification</td>
<td>3.1500</td>
</tr>
<tr>
<td>5</td>
<td>drilling blind holes</td>
<td>2.9116</td>
</tr>
<tr>
<td>6</td>
<td>drilling round stock</td>
<td>2.8333</td>
</tr>
<tr>
<td>7</td>
<td>counter-boring and counter-sink</td>
<td>3.1167</td>
</tr>
<tr>
<td>8</td>
<td>drilling large diameter holes</td>
<td>3.09</td>
</tr>
</tbody>
</table>

Data in table 4 revealed the t-test analysis of responses of mechanical engineering students and lecturers in Rivers State Polytechnics. The students and lecturers have grand means that are all greater than 0.05% level of significance. This shows that the respondents agreed that there is a significant difference in the mean responses of the respondents on the areas for improving working
principles of the center lathe and it basic operations among mechanical engineering students for Industrialization in Rivers State Polytechnics.

Findings of the Study
Findings of the study identified the strategies for improving the Production of simple engineering components skills among mechanical engineering students for Industrialization in Rivers State Polytechnics. This is in line with Osinem & Nwojo (2005) who viewed Skill as the proficiency displayed by someone in the performance of a given task.
The findings also identified improving working principles of the center lathe and it basic operations skills among mechanical engineering students for Industrialization in Rivers State Polytechnics. This is in line with Oranu, & Ogwo (2006) who explained that mechanical technology involves activities in occupations that entail designing, processing and fabrication of metal products; it includes activities in foundry, forging, machine shop and welding.

Conclusion
The development of a nation largely depends on the amount of output it can procure per unit input. Nigeria’s inability to properly develop its human and material resources is manifest in low productivity as shown not only in high prices of industrial products in the domestic market but also in the lack of competitiveness in the international market. A mass of skilled labour force, will serve as catalyst for transforming the abundant natural resources into industrial products. Successful industrial development can be achieved through addressing the challenges of consumption patterns and reduction systems by adequate and provision of polytechnics, technical and vocational education as well as strengthening the apparatus for teaching and learning of technology courses all over the country. The study revealed that there is no significant difference in the mean ratings of the respondents on the strategies for improving local content development among mechanical engineering students in Rivers State Polytechnics.

Recommendation
Establish strong linkage and collaboration between polytechnics institutions and the industry: This will provide opportunities in industry for polytechnics teachers to regularly update their workplace experience and will also help to develop appropriate curricular that is relevant to employers’ needs.

Introduce sustainable financing scheme for polytechnics: Government needs to increase the percentage of total expenditure on education to polytechnics and grant financial aids to trainees who are interested in pursuing technical training programme at whatever level. The aids could be in terms of grants, sponsorships and loans. This will in turn attracts people, enhance interest and shift considerable attention to the relevance of technical training.

Remove discrimination against graduates of polytechnics institutions: This call for parity in career progression for HND and first degree holders, correction of anomaly of non registration of polytechnics graduates by professional bodies and placement of HND and first degree holders on the same salary scale and step.

Enforce good staff development training programme: the staff development centers should be mandated to carry out the responsibility for which they were established.

Government, NGOs and/or wealthy Nigerians should:
- Develop and improve polytechnics programs to respond to the economic needs of the country.
- Control foreign investment and enhance Nigerian local content.
- Support and encourage small scale producers and entrepreneurs in medium size plants.
- Support technological innovations and patronize local manufactured products.
- Develop standards and protection against sub-standard equipment.

REFERENCES


