# Application Of Vocational Skills In The Construction Of Vertical Palm Kernel Nut Cracking Machine

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**ABSTRACT**
The study examined the role of Vocational Skills in the construction of a Vertical Palm Kernel nut cracking machine. Descriptive research design was used. The population was Nineteen (19), which comprises of Five (5) instructors and Fourteen (14) ND 2 Mechanical Engineering Students of Federal Polytechnic Ekowe, Bayelsa State. The whole 19 was also used as the sample because it is relatively small. A questionnaire titled Measuring Filling Cutting, Welding and Assembling Skills Test (MFCWAT) was used for the data collection. Five research questions and hypothesis were raised for the study. Mean and standard deviation was used to analyze the data collected while t-test was used to test the two-null hypothesis at 0.05 level of significance. Findings revealed that Vocational Skills such as Measuring Filling Cutting, Welding and Assembling are needed by students for the fabrication of the Vertical Palm Kernel nut cracking Machine. It also revealed the problems associated with cracking and supply-demand gap of Palm Kernel. It was therefore, recommended that government and Private Fabricating Firms should go into full production of cracking machines to aid in mass production of cracked shells and nuts from palm fruits to meet the needs of Pharmaceutical, Cosmetics as well as Food Processing Industries.
**Keywords**: Vocational Skills, Vertical, Palm Kernel Nut, Cracking Machine, Construction.

**INTRODUCTION**
The oil palm tree (*Elaesis guineenis*) is one of the greatest economic assets a nation can acquire only if its importance is realized and fully harnessed (Encyolopedia Britannica' 2015). It bears its fruits in bunches which vary from 10 to 40kg. The individual fruit ranges from 60 to 70g and made up of an outer skin (exocarp), a pulp (mesocarp), which contains the palm oil in a fibrous matrix, a central nut consisting of a shell (endocarp) and the kernel which itself contains a type that is different from the ordinary oil but resembles coconut oil (FAO, 2004). The oil palm fruits are classified into three groups based on their internal structures which are Dura — thick nuts with less mesocarp thickness; Tenera — thin nuts with thicker mesocarp; and Pisifera — Small nuts with mesocarp (anyone, 1966).
Palm kernel is a major viable agricultural produce in Nigeria. Palm kernels are obtained from the palm nuts of the palm tree after cracking the palm nuts and removing the shells. The most common practice of cracking palm kernel in parts of Nigeria was stone arrangement and Mortar and Pestle method. The first method employs the principle of impact in achieving kernel cracking. This is done by placing about 6 nuts on a flat stone using another stone as a hammer to crack them. This method is crude and the kernel recovery is slow, uneconomical, labour intensive and sometimes hazardous to the operator. The output may be up to 50kg of kernel in a working day per worker (Schultes, 1990). This method of cracking cannot match the demand of palm kernel required by the industries as well as, export.

Machine is the devise that comprises of the stationary part and moving parts combined together to generate, transform or utilize the mechanical energy. Adebayo (2004), stated that in the topics, especially where palm trees are found people have made various design and constructions to the design of cracking machines. The determination of some design parameters for palm nut cracker was worked upon by Akubuo (2002).

The cracking machine was developed to cater for all physical characteristics of the palm kernel varieties (Dura and Tenera) such as the different sizes of palm kernel nuts, the shell and the kernel. The extraction of the nuts from the shell has not been easy task. The cracking of palm nuts to release the kernel is a critical step that affects the quality of the oil. The kernels are not useful until they are separated from the shell. This is where vocational skills come in.

A skill could be defined as the ability to perform a simple, or complex manipulative act of a job task to an acceptable standard. According to Okorie (2000), skill is the ability to do something expertly and well. It is an organized sequence of actions, proficiently executed and usually displaying a flexible but systematic temporal patterning. Njoku (2002) opined that to possess a skill is to demonstrate the habit of acting, thinking and behaving in a specific activity in such a way that the process becomes natural to, the individual through repetition or practice skills are therefore essential to achieve perfection in any construction.

Vocational education is that aspect of educational programme that emphasizes knowledge, skills, work habits and positive attitudes in the development of individuals for the World of work. Wapmuk (2011) describes vocational education as a programme that skillfully prepares people for effective performance of practical tasks, that involve the acquisition of skills and competencies that can help individual to function productively in industrial and commercial occupations. While Daso (2012) regards vocational education as a programme of study designed to enable the learner to be theoretically and practically biased for the acquisition of necessary skills, abilities, knowledge, values, understanding and attitudes through a formal educational system that will integrate the learners into the society in areas such as agricultural education, business education, home economics education, computer science education, health education, computer science education, health education etc. in order to earn a living.

## LITERATURE REVIEW
### Importance of Palm Kernel
Industries need income for their growth, development and survival. One way of doing it is to encourage palm kernel production. Most industries sell palm kernel, and its products to earn cash, which is used to pay taxes, electricity bills, wages and also salaries of workers.

Palm kernel serve as a raw material to Pharmaceutical industries, cosmetics industries, food processing industries e.t.c. By locally producing the raw materials, it ensures steady supplies of these raw materials to the industries. Iwena (2015) opined that raw palm kernel supplies several industries with raw materials for their continuous existence.

According to Ukwutemo (2011), palm kernel oil is used as skin lotion or as laxative, when mixed with kerosene, it is used as a wood polish. Furthermore, palm kernel cake forms a good portion and/or an excellent feed Livestock and poetry, feed). In corroboration, Ajieh (2013) affirmed that palm kernel oil is used in the manufacture of margarine, cooking fats, lubricants, pomade and a source of glycerin. According to NIFOR (2008), the shell from cracked palm nuts provides not only fuel in industries but also serve as an aggregate for flooring houses.

However, Sarku (2017) and Hossain (2013) further argued that palm kernel oil has a little application for and non-food products. While Zulkafli et. al (2013) averred that palm kernel oil contains lauric acid which counts for about 48 per cent of the composition of fatty acid in palm kernel oil. The oil also contains muriatic acid (16%) and oleic (15%) respectively. The lauric acid in the palm kernel oil is of commercial value because it is suitable for processing edible food such as: chocolate coating, toffees, coffee whiteners, whipped toppings as cream in cake, chocolate bar, cake candy, jelly, fried snacks, filler creams and non-dairy products.

Also in industrial production according to prominent manufacturers and suppliers (PMS 2020) palm kernel is used to make oil fatty acids, fatty alcohols and glycerol. For cosmetics application, the kernel oil is extracted and made into handmade soap, shampoo, laundry detergent, toothpaste and other personal and home care products.

According to Dike (2009), reported that the market for palm kernel oil and palm kernel oil is large, expanding and sustaining hence driving the need for palm kernel nut. An estimated national population growth rate of 3.5% per annum in the past 5 years is a large market for palm kernel oil because of the numerous application of the product.

Corroborating the above, Okon (2019) affirmed that a huge profit can be made from supplying palm kernel oil and palm kernel cake is huge, sustainable and expanding. That the estimated size of the local market for palm kernel oil is put at about N4.24bn, while the market for palm kernel cake is estimated at N3.3bn. Food and beverage industries in Nigeria process palm kernel oil into vegetable oil and confectionery. About 80% of all edible vegetable oil consumed in Nigeria is made from refined palm kernel oil (Okon, 2019). Manufacturing companies process kernel oil into soap, creams, candles and perfumes. This further point to the fact that so many industries depend on palm kernel and its by-products for usage, thereby providing a lot of market for industries to go into mass production to boost the nation's economy. This will continuously lead to the creation of more jobs to absorb the teeming unemployed youths, thereby contributing to the reduction of unemployment in the country.

**Contribution to Economic Growth / Development**
Like any other agricultural product, palm kernel and its products also play their fair share in the economic growth and development of Nigeria. According to Ekenta et.al (2017), the importance of palm kernel to the national economy ranges from production of food for human consumption, employment, income to farmers and raw materials for industries. Being a product of agriculture, palm kernel also contributes meaningfully to the economic, industrial and economic growth and diversification of Nigeria.

The place of palm kernel and its products in the industrial growth and the economic diversification in Nigeria is very important. A nation that needs development should be able to provide raw materials needed by its industries and should be able to diversify her economy. The availability of essential raw material such as palm kernel and its effective utilization will increase the capacity of the industries, which will also ensure the growth in the nation's economy. The continuous production of palm kernel and its products will open up more rooms for industries to go into mass production to boost the nation's economy. This will continually lead to the employment of the teeming unemployed youths thereby contributing to the country.

Proper and adequate investment in palm kernel production will reduce to a greater extent the nation's dependent rate on crude oil and other extractive sectors. There is need to diversify the economic through palm kernel. Palm kernel has enough products that is sufficient to justify the investment and secondly, the products from palm kernel have a market that is big enough to generate income that is sufficient to justify the investment. This will enable Nigeria to shift her attention from crude oil to palm kernel as one of the major sustainers of the country's economy.

Palm kernel as an agricultural produce is a source of foreign exchange palm oil and palm kernel according to Ukwuteno (2011) have been important commodities in International Trade in Nigeria. In fact, palm oil and palm kernel from the bulk of exportable products up to late 1960s and even early independent era. This has earned substantial foreign exchange for Nigeria.

Usoro (1974) and Idachara (2005), also reported the contributions of palm kernel to export earnings; and secondly, the fact that exports production of palm kernel is a major source of income to 'a substantial proportion of the rural agricultural population in the southern states of Nigeria.

The importance and contribution of palm kernel, which is one of the major products of oil palm to the growth and development palm kernel still remains one of the veritable means of reducing uncertainties in the oil and gas sector. This is because according to Theories (2006) in Behrooz and Benjamin (2013) in measurable terms, palm kernel has shown improvement that outstripped its closest alternatives. Similarly, Edoumiekumo and Tamuno (2010) as cited in Behrooz and Benjamin (2013) asserted that the

consumption of palm kernel has been on the increase globally. All these point to the fact that palm kernel could be a veritable source of revenue earnings for the country.

**The Demand Supply Gap of Palm Kernel**

As an essential commodity, in as much as the demand is high, the supply therefore will also be very high. For the market of palm kernel to be at equilibrium, the demand and supply of the commodity need to complement each other. Demand normally means the desire or willingness for a good while supply is the quantity of good or service offered by a producer for sale at different prices in a given market at a point of time. Having seen the meaning of demand and supply, there is also the need to look into the demand and supply gap of palm kernel. From time immoral, the issue of demand and supply of oil palm; palm kernel has been a thing of great importance to the society. As, iris several industries are depending on palm kernel for the production of different goods. This tells -us how well palm kernel is demanded; as such, there is the need to ascertain the demand and supply gap of the product.

According to Kei, Mywish and Duncan (1997) as cited in Behrooz and Benjamin (2013), the increase in the demand for oil palm produce (palm kernel), sequel to the increase population and income growth, relative to the low productivity of oil palm sector, Nigeria has become a net importer of palm oil (palm kernel and its products. They went further to' state that palm kernel production in Nigeria is potentially competitive in the local market, and if palm kernel production is increased by shifting the technology frontier further, the demand and supply gap will to a large extent be complemented. Dike (2009) also posited that the market for palm kernel cake, a bye product in the milling of palm kernel oil is large, expanding and sustaining hence driving the need for palm kernel nuts.

However, in all, the demand and supply gap of palm kernel in Nigeria shall be discussed under two sub-heading as adopted from Martins library (2014):

a. Local Demand: The demand for crude palm kernel oil (CPKO) in the local market is very huge. As a matter of fact, the demand for it is all year round; and the profit in this business is mouth-watering. Due to the high demand of the product, the buyers sometimes book for the product in advance. Sometimes it is also on cash and carry basis and buyers even pay in advance in order to secure the products. Going-by a detailed research, Martins Library (2014) presents a detailed analysis which shows that the demand — supply gap is currently estimated between 500,000MT - - 600,000MT per annum. That Nigeria requires 1,722,000 tons of vegetable oil and fats to meet the national requirements for food and non-food uses. Martins Library (2014) affirmed, that the total palm oil and palm kernel production per annum is currently about 741,800 tons. That even though the ban on crude oil importation into the country was lifted in 2008 that have not bridge the gap. As such, the demand — supply gap opens up an opportunity for investors in the sector in terms of farming, production, logistic and marketing.

b. Industrial Demand Gap: In a company in North, East, South and West, the estimated quantity 'demand needed for production in 3 years was 95,838 tons, while the actual supply received was 48,000 tons leaving the company with a supply deficit of 47,838 tons. In a related development, Martins library (2014) still affirmed that 72,200 tons for production, but the actual supply received from suppliers was 16,300 tons, leaving a supply deficit of 55,900 tons. Also, another Company in the Region needed 34,000 tons for production and got an actual supply of 12,200m tons, leaving a supply a deficit of 21,800 tons.

However, from the above analysis it is observed that there is a very wide gap existing between the demand and supply of palm kernel in the country. This gap further shows that those (producers/suppliers) that are, into the actual production of palm kernel are very few compared to these (consumers) that need this product for usage. Since the companies/industries that need the product are more than the suppliers, the multiplier effect is the high cost of the product and other essential commodities produced from it.

**Measuring skills**

These are skills required for the measurement of one parameter or other in the construction of the cracker. Adequate knowledge on these will ensure the achievement of the required dimensions for the construction

of the machine. In order to have efficiency in the cracking process, the various sizes of palm kernel should be considered in the fabrication and construction of the cracker.

## Cutting/Marching Skills

There are skills the worker need to display; the ability to quickly and repeatedly adjust the control of a machine or other pieces to exact position(s), the ability to make precisely coordinated movements of the fingers of one or both hand to grasp, manipulate, or assemble very small objects. In all, to achieve the desired machine, he must be able to perform physical activities that require considerable use of the arms and legs and moving the whole body, such as climbing, lifting, balancing, walking, stooping and handling of materials.

## Welding Skills

Welding Skills are abilities and knowledge required for the fabrication and joining of metals and/other equipment together to form a whole. Also required/needed for the joining together of two pieces of metal so that bonding takes place at their original boundary surface. To make effective use of the palm kernel cracker, it is essential that a high degree of confidence be achieved in predicting the weld parameters to attain the mechanical strength in the welded joints.

## Filling Skills

These are abilities and knowledge required to fill different products into the machine. It involves several activities like the watching of gouges, dials and output to make sure a machine is working properly. These skills are also responsible for running the machines. Operating the machine may be tasking and the task must be completely for many hours. This is especially important because injuries or accidents may occur if the operator get distracted or fatigued (Mighty Recruiter, 2020).

## Assembling Skill

These are the knowledge and abilities required to put a palm kernel cracking machine. The acquisition and mastery of these skills is very important and necessary because it involves studying assembling instructions, blueprint specifications and part lists, gather parts, sub-assemble, tools and materials. Assemblers must work on putting one set of components or work on the finished product. According to Truity Psychometrics LLC (2020), assemblers put together complex machines, for example, read detailed schematics that show how to assemble the machine. Once the parts are properly aligned, they connect them with bolts and screws or they weld or solder pieces together. In the fabrication and construction of a palm kernel cracker, quality control is important throughout the assembling process, so assemblers should look for faulty components and mistakes in the assembly process. This will help in fixing problems before defective products (machines) are made.

## Purpose of the Study

The major purpose of the study is to determine the application of vocational skills in the construction of vertical palm kernel nut cracking machine. Specifically, the study intends to determine the extent to which:
1. Measuring skills is applied in the construction of vertical palm kernel nut cracking machine.
2. Cutting / matching skills is applied in the construction of vertical palm kernel nut cracking machine.
3. Welding skills is applied in the construction of vertical palm kernel nut cracking machine.
4. Assembling skills is applied in the construction of vertical palm kernel nut cracking machine.

## Research Questions

The following research questions guided the study:
1. What is the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine?
2. What is the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine.
3. What is the extent of relevance of welding skill in the construction of vertical palm kernel nut cracking machine

4. What is the extent of relevance of assembling skill in the construction of vertical palm kernel nut cracking machine.

**Hypotheses**

The following null hypotheses was tested at 0.05 level of significance and used for the study:

1. There is no significant difference between mean response of instructors and students on the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine.
2. There is no significant difference between mean response of instructors and students the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine.

**Scope**

The study is limited to the skills relevant in constructions of vertical palm kernel nut cracking machine

**MATERIALS AND METHODS**

The study adopted a descriptive design. The population was 19 comprising of five (5) lecturers and fourteen (14) part 2 Mechanical Engineering students of Federal Polytechnic, Ekowe, Bayelsa State. The instrument for data collection was validated by three experts, one from Mechanical Engineering department of Niger Delta University, Bayelsa State and the two from Bori Polytechnic, Bori in Rivers State. The essence was to ensure clarity of content, coverage and suitability for use in carrying out the study. Their comments and inputs were noted and incorporated into the final draft that was used. Test-retest method was used to establish the reliability co-efficient which yielded and a score of 0.67.

The instrument was administered by the researchers directly to the respondents. The data collected was analyzed using Mean and Standard deviation. While t-test was used to test the two null hypothesis at 0.05 level of significance. The instrument contains a total of 48 items. A five (5) point Likert scale was used which was graded as VGE (5), GE (4), ME (3), LE (2) and VLE (1). Mean was used to answer the five research questions and any item that scores a mean value of 2.50 and above was regarded as accepted while any below 2.50 was regarded as rejected. In testing the null hypothesis, if the calculated value is greater than the critical value at 0.05 alpha level, the hypothesis of no significance difference is accepted but if on the contrary, the null hypothesis was rejected.

**Area of the Study**

The study was carried out in Federal Polytechnic, Bayelsa State. The state is located in the Niger Delta Region of Nigeria. Bayelsa State is an oil rich region with little commercial activities and fishing activities.

**Construction and Fabrication Technique**

The fabrication and construction of vertical palm kernel cracking machine was arranged in stages:

1. The construction was carried out independently on each component.
2. Each part was produced using different method to achieve accurate result.
3. The hopper was produced from mild steel plate by cutting, making, welding and filling process.
4. The students folded a thick steel pipe that is placed at a certain angle.
5. The technologist calculated the size and angle of the cracking chamber before installing on the machine.
6. They aided in constructing the stand and frames as a base stand of the machine.
7. The electrical appliance was installed on the base stand of the machine.
8. Steel blades were constructed and mounted in the cracking chamber.
9. The shaft was machined using the turning tool and fitted with shoulder for bearing.
10. The v-belt was connected as part of the pulley system.
11. Steel plate was folded and fitted and created as a cover for the cracking chamber.
12. The students fitted in the required bolt and nuts on the various part of the machine.

**DATA ANALYSIS**
**Research question 1:** *To what extent does the application of measuring skills relevant in the construction of a vertical palm kernel cracking machine?*
Table 1: Response of instructors on the application of measuring skills relevant in the construction of a vertical palm kernel cracking machine

| S/NO | ITEMS | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|------|-------|-----|-----|-----|-----|-----|------|-----|----------|
| 1 | Is skill of no parallax error required in using measuring instrument | 3 | 1 | 1 | - | - | 4.40 | 1.98 | Accept |
| 2 | Skill of No parallax error required in using measuring instruments to standard cutting of parts or machine element | 3 | 1 | 1 | - | - | 4.40 | 1.98 | Accept |
| 3 | The ability to transfer inside and outside dimensions unto standard measuring instrument required in cutting work | 2 | 1 | 1 | 1 | - | 3.80 | 1.50 | Accept |
| 4 | Skill of precise setout of dimensions required in cutting / mating of work piece | 4 | 1 | - | - | - | 4.80 | 2.29 | Accept |
| 5 | The ability to transfer inside and outside dimensions unto standard measuring instrument required in cutting work | 5 | - | - | - | - | 5.00 | 2.45 | Accept |
| 6 | **Grand mean** | | | | | | **4.48** | **2.04** | |

Table 2: Response of students on the application of measuring skills relevant in the construction of a vertical palm kernel cracking machine

| S/NO | ITEMS | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|------|-------|-----|-----|-----|-----|-----|------|-----|----------|
| 1 | Is skill of no parallax error required in using measuring instrument | 10 | 2 | 2 | - | - | 4.57 | 2.12 | Accept |
| 2 | Skill of No parallax error required in using measuring instruments to standard cutting of parts or machine element | 8 | 2 | 2 | 2 | - | 4.14 | 1.67 | Accept |
| 3 | The ability to transfer inside and outside dimensions unto standard measuring instrument required in cutting work | 10 | 2 | 2 | - | - | 4.57 | 1.87 | Accept |
| 4 | Skill of precise setout of dimensions required in cutting / mating of work piece | 10 | 2 | 2 | - | - | 4.57 | 1.87 | Accept |
| 5 | The ability to transfer inside and outside dimensions unto standard measuring instrument required in cutting work | 8 | 2 | 2 | 2 | - | 4.14 | 1.67 | Accept |
| 6 | **Grand Mean** | | | | | | **4.40** | **1.84** | |

Findings obtained from table 1 on instructors' response revealed that item 1, 2, 3, 4 and 5 were all accepted to the various questions. Also, findings from table 2 on students' response revealed that item 1, 2, 3, 4 and 5 were all accepted to the various questions. This indicates that skill of no parallax error,

standard cutting of parts or machine element, skill of precise setout of dimensions and ability to transfer inside and outside dimensions into standard are required in using measuring instrument.

**Research Question 2:** *To what extent is the application of cutting / mating skills relevant in the construction of a vertical palm kernel nut cracking machine?*

Table 3: Response of instructors on application of cutting / mating skills relevant in the construction of a vertical palm kernel nut cracking machine

| S/NO | Items | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|------|-------|-----|----|----|----|-----|------|----|----------|
| 7 | The ability of identification of mating dimension to degree specification required for proper cutting / mating of machine members | 5 | - | - | - | - | 5.00 | 2.45 | Accept |
| 8 | Ability to select a hacksaw blade of the right type for varying jobs | 4 | 1 | - | - | - | 4.80 | 2.29 | Accept |
| 9 | The ability of testing the straightness and flatness of work edges required in cutting mating of machine elements | 3 | 1 | 1 | - | - | 4.40 | 1.98 | Accept |
| 10 | The ability of teeth setting of the saw blade required in the cutting / matching work | 2 | 1 | 1 | 1 | - | 3.80 | 1.50 | Accept |
| 11 | The ability of making the right choice of grade of files required in cutting of nut cracker machine members | 3 | 1 | 1 | - | - | 4.40 | 1.98 | Accept |
| 12 | **Grand Mean** | | | | | | **4.48** | **2.04** | |

Table 4: Response of students on application of cutting / mating skills relevant in the construction of a vertical palm kernel nut cracking machine

| S/NO | Items | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|------|-------|-----|----|----|----|-----|------|----|----------|
| 7 | The ability of identification of mating dimension to degree specification required for proper cutting / mating of machine members | 8 | 2 | 2 | 2 | - | 4.14 | 1.67 | Accept |
| 8 | Ability to select a hacksaw blade of the right type for varying jobs | 10 | 2 | 2 | - | - | 4.57 | 1.87 | Accept |
| 9 | The ability of testing the straightness and flatness of work edges required in cutting mating of machine elements | 8 | 2 | 1 | 1 | 2 | 3.93 | 1.62 | Accept |
| 10 | The ability of teeth setting of the saw blade required in the cutting / matching work | 10 | 2 | 2 | - | - | 4.57 | 1.87 | Accept |
| 11 | The ability of making the right choice of grade of files required in cutting of nut cracker machine members | 8 | 2 | - | 2 | 2 | 3.86 | 1.72 | Accept |
| 12 | **Grand Mean** | | | | | | **4.23** | **1.75** | |

Findings obtained from table 3 on instructors' response revealed that item 7, 8. 9, 10 and 11 were all accepted to the various questions. Also, findings from table 4 on students' response revealed that item 7, 8, 9, 10 and 11 were all accepted to the various questions. This indicates that the ability of identification of mating dimension to degree specification, ability to select a hacksaw blade of the right type for varying jobs, ability of testing the straightness and flatness of work edges, ability of teeth setting of the saw blade and ability of making the right choice of grade of files required in cutting of nut cracker machine members.

**Research question 3:** *To what extent is the application of welding skills relevant in the construction of a vertical palm kernel nut cracking machine?*

Table 5: Response of instructors on application of welding skills relevant in the construction of a vertical palm kernel nut cracking machine

| S/NO | Items | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|------|-------|-----|----|----|----|-----|------|-----|----------|
| 13 | Ability to select the appropriate welding method required in the fabrication of nut cracker machine member | 4 | 1 | - | - | - | 4.80 | 2.29 | Accept |
| 14 | Use the appropriate welding method | 2 | 2 | 1 | - | - | 4.20 | 1.75 | Accept |
| 15 | use the control appropriate arc length / cutting required in welding | 4 | - | - | - | 1 | 4.20 | 1.87 | Accept |
| 16 | Ability to choose the appropriate electrode required in the welding | 3 | 1 | 1 | - | - | 4.40 | 1.98 | Accept |
| 17 | ability to strike and maintain arc required in welding of nut cracker machine members | 2 | 2 | 1 | - | - | 4.20 | 1.75 | Accept |
| **18** | **Grand Mean** | | | | | | **4.36** | **1.93** | |

Findings from table 3 revealed that item 13, 14, 15, 16 and 17 were all accepted to the various questions. This indicates that the ability to select the appropriate welding method, use the appropriate welding method, use the control appropriate arc length / cutting, ability to choose the appropriate electrode and ability to strike and maintain arc required in welding of nut cracker machine members.

**Research Question 4:** *To what extent is the application of assembling skills relevant in the construction of a vertical palm kernel nut cracking machine?*

Table 6: Response of instructors on application of assembling skills relevant in the construction of a vertical palm kernel nut cracking machine

| S/NO | Items | VGE | GE | ME | LE | VLE | Mean | SD | Decision |
|---|---|---|---|---|---|---|---|---|---|
| 19 | Ability to select appropriate device for assembling and testing required in efficiency of assembled machine members | 5 | - | - | - | - | 5.00 | 2.45 | Accept |
| 20 | The ability to select appropriate lifting equipment for alignment with respect to horizontal height required in the assembly of nut cracker shift and couplings | 4 | 1 | - | - | - | 4.80 | 2.29 | Accept |
| 21 | The ability to test the straightness and roundness of finish surfaces with respect to centre distance required in the assembly of the nut cracker machine member | 3 | 2 | - | - | - | 4.60 | 2.12 | Accept |
| 22 | The ability to provide the right type of seating for fasteners required in the assembly of nut cracker member | 3 | 2 | - | - | - | 4.60 | 2.12 | Accept |
| 23 | The ability to carry out alignment for shaft, pulley, coupling, belt and chain required in the assembly of the nut cracker machine element | 2 | 3 | - | - | - | 4.40 | 1.97 | Accept |
| **24** | **Grand Mean** | | | | | | **4.68** | **2.19** | |

Findings from table 3 revealed that item 19, 20, 21, 22 and 23 were all accepted to the various questions. This indicates that the ability to select appropriate device for assembling and testing, ability to select appropriate lifting equipment for alignment with respect to horizontal height, ability to test the straightness and roundness of finish surfaces with respect to centre distance, ability to provide the right type of seating for fasteners and ability to carry out alignment for shaft, pulley, coupling, belt and chain are required in the assembly of the nut cracker machine element.

**Hypothesis1**

There is no significant difference between mean response of instructors and students on the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine.

Table 7: T-test analysis of difference between mean response of instructors and students on the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine

| S/No | Items | N | Mean | SD | Df | T-tab | T-cal | Decision |
|---|---|---|---|---|---|---|---|---|
| 1 | Instructors response on relevance of measuring skill | 5 | 4.48 | 2.04 | 17 | 1.740 | 0.07 | Not significant |
| 2 | Students response on relevance of measuring skill | 14 | 4.40 | 1.84 | | | | |

Findings from table 7 revealed that t-calculated value of 0.07 is less than t-tabulated value of 1.740 at 0.05 level of significance. This implies that the null hypothesis was accepted. This means that there is no

significant difference between mean response of instructors and students on the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine.

**Hypothesis 2**

There is no significant difference between mean response of instructors and students the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine.

Table 8: T-test difference between mean response of instructors and students the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine

| S/No | Items | N | Mean | SD | df | T-tab | T-cal | Decision |
|------|-------|---|------|----|----|----|----|-------|
| 1 | Instructors response on relevance of cutting skill | 5 | 4.48 | 2.04 | 17 | 1.740 | 0.22 | Not significant |
| 2 | Students response on relevance of cutting skill | 14 | 4.23 | 1.75 | | | | |

Findings from table 8 revealed that t-calculated value of 0.22 is less than t-tabulated value of 1.740 at 0.05 level of significance. This implies that the null hypothesis was accepted. This means that there is no significant difference between mean response of instructors and students the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine.

**DISCUSSION OF FINDINGS**

**Vocational skills in Fabrication**

Findings from the study revealed that skill of no parallax error, standard cutting of parts or machine element, skill of precise setout of dimensions and ability to transfer inside and outside dimensions into standard are required in using measuring instrument. This is in line with the view of Fisher (2002) requisite skills are needed to provide specific guidance to students to improve the accuracy, precision, and reliability of measurements.

Findings also show that the ability of identification of mating dimension to degree specification, ability to select a hacksaw blade of the right type for varying jobs, ability of testing the straightness and flatness of work edges, ability of teeth setting of the saw blade and ability of making the right choice of grade of files required in cutting of nut cracker machine members. This supports the opinion of Bruce (2015) cutting skill is generally applied to engineering components which are used to produce flat sheet of metal which is cut to shape and then folded to form the finished article. The edges are then secured by a variety of methods such as welding, brazing, soldering and riveting.

Findings also reveal that the ability to select the appropriate welding method, use the appropriate welding method, use the control appropriate arc length / cutting, ability to choose the appropriate electrode and ability to strike and maintain arc required in welding of nut cracker machine members. This also in line with the view of Idris and Rajuddin (2012) investigated the level of importance and competencies of employability skills among the final year TVET students in Nigeria. Further, The National Board for Technical Education (NBTE, 2008) also stated that graduates of fabrication and welding should be able to develop skills and carry out gas welding and cutting jobs on all types of metals, produce simple finished structural steel work projects with safety, use relevant equipment and techniques, apply protective wetting against corrosion on finished metal projects and market finished metal projects.

Further findings also show that the ability to select appropriate device for assembling and testing, ability to select appropriate lifting equipment for alignment with respect to horizontal height, ability to test the straightness and roundness of finish surfaces with respect to centre distance, ability to provide the right type of seating for fasteners and ability to carry out alignment for shaft, pulley, coupling, belt and chain are required in the assembly of the nut cracker machine element. The demand to qualify workers is especially high for companies in the special machinery segment, as they need highly educated and skilled workforces that can carry out assembly process (Philipp and Günther, 2016).

Findings also revealed that there is no significant difference between mean response of instructors and students on the extent of relevance of measuring skills in the construction of vertical palm kernel nut cracking machine. This is in line with the opinion of Fisher (2002) that opined that both instructors and technician needs to be accurate in measurement skill utilization.

In addition, it was further revealed that there is no significant difference between mean response of instructors and students the extent of relevance of cutting / matching skills in the construction of vertical palm kernel nut cracking machine. This also agrees with the opinion of Bruce (2015) which opined that cutting skills should key to avoid material wastage.

**CONCLUSION**
In all, the study showed that vocational skills such as welding, cutting, measuring and assembling skills are needed by students for fabrication in engineering works.

**RECOMMENDATIONS**
The following recommendations were made from this study:
1. Based on the development of this machine, it would be recommended therefore that government and private fabricating firm should go into production of vertical palm kernel cracking machine to aid in mass production of cracked shells and nuts from palm fruits to meet the demand of industries and other areas.
2. Government and technical institutions at all level should engage students in practical and mass fabrication project related in palm kernel production to enhance students' skills.

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