International Journal of Innovative Scientific & Engineering Technologies Research 9(4):48-57, Oct.-Dec., 2021

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Design And Fabrication Of Gas Powered Palm Oil Processing Mill For The Development Of Vocational Skills Among Students

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ABSTRACT
The study looked at design and fabrication of gas powered palm oil processing mill for the development of vocational skills among students. The study used three research questions and one hypothesis. The study employed research and development pattern as method of design in the work. The study used a population of 10 lecturers in the department of mechanical engineering in Federal Polytechnic, Ekowe, Bayelsa State. The population of 10 was also adopted as sample for the study. The study developed an instrument titled "Development of Vocational Skills amongst Students (DVSAS). The instrument was subjected to face and content validation by two experts in the department of vocational and Technology Education, Niger Delta University, Bayelsa State. The researchers employed mean and standard deviation for the calculation of research questions and used t-test for the analysis of the hypothesis. Findings from the study showed that welding skills, filling skills, measuring skills, drilling skills, cutting skills and finishing skills are maximally utilized in the production of gas powered palm oil processing mill. Also, finding revealed that students to a very high extent adapt to the various vocational skills used in the production of palm oil processing mill. The finding from the hypothesis showed that there is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill. Finally, it was recommended amongst others that Fabrication of gas powered palm oil processing mill should be mass produced by students and institutions for fund generation and students skill development.
Keywords: Design, Fabrication, Gas Powered Palm Oil Processing Mill & Vocational Skills

INTRODUCTION
Vocational education is designed to give students the needed practical knowledge for the purpose of production and development of skills in the world of work. Vocational education is education that prepares people to work as a technician or in various jobs such as a trade or a craft. Vocational education is sometimes referred to as career and technical education. A vocational school is a type of educational institution specifically designed to provide vocational education. Vocational skills are usually based on

manual or practical activities, traditionally non-academic, related to a specific trade, occupation or vocation. It is sometimes referred to as technical education as the trainee directly" develops expertise in a particular group of techniques.

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Vocational education, instruction intended to equip persons for industrial or commercial occupations. It may be obtained either formally in trade schools, technical secondary schools, or in on-the-job training programs or, more informally, by picking up the necessary skills on the job. At the post-secondary level vocational education is typically provided by an institute of technology, university, or by a local community college to benefit everyone includes exceptional persons for sustainable development (Elemukan and Ugo, 2017).

Vocational and Entrepreneurial education is becoming a worldwide concept due to world growing under employment and poverty index. It is conceptualize as a process of impacting in exceptional person's attitudes, skills and knowledge of managing risk involved in reasonable venture that can enhance their capacity and self-dependence in the society in which they belong. (Iroegdu, and Unegbu, 2017).

The goals of educating persons with visual impairment include effective communication, social competence, employability and personal independence (FRN, 2019) Method of educating Persons with visual impairment depends on information gathered through sensory media other than vision. Basically, 3 ways through which persons with visual impairment can get information from the environment include verbal description, use of tactile stimuli and self-exploration about the world however this modalities cannot effective compensate visual stimuli but just to reduce the impact to learning caused by lack of vision. Therefore when teaching persons with visual impairment it must be emphasized that touch and hearing are very important senses. Iroegdu, and Dala, (2017)

Vocational Education is the birth rock of national development plans of numerous civilizations. This is because it helps to develop human resources, make them more productive and useful to the society and leads to massive economic expansion and advancement. Irrespective of this conspicuous contribution of vocational training to the development of any nation Nigeria unfortunately have not been able to tap from this aspect of human resources development. The neglect of vocational and marginal attention given to the sector by our government is undoubtedly one of the top reasons why there is massive unemployment in Nigeria (Inibehe, and Otobong, 2016).Through vocational skills a lot of equipments and materials can be produced. Vocational skills can be used for production of agricultural products such as palm kernel cracker, palm oil mill, containers and so on.

The fabrication of gas powered mill can be used for mass production of palm oil. The fabrication method requires a lot of skills such as welding, cutting, milling, assembly and finishing skills. These skills can be leant on the job especially on major projects.

There is the need to see how students through the construction of gas powered palm oil mill can be able to utilize and adopt various vocational skills during the production process.

Purpose of the Study

The study looked at design and fabrication of gas powered palm oil processing mill for the development of vocational skills among students. Specifically the study sought to:

1. Determine the method of construction used in the production of gas powered palm oil processing mill.
2. Find out the level of utilization of vocational skills by students in the production of gas powered palm oil processing mill.
3. Determine the extent of adaptation of vocational skills by students in the production of gas powered palm oil processing mill.

Research Questions

The following research questions were developed and served as a guide for the study.

1. What is the method of construction used in the production of gas powered palm oil processing mill?
2. What is the extent of utilization of vocational skills by students in the production of gas powered palm oil processing mill?
3. What is the extent of adaptation of vocational skills by students in the production of gas powered palm oil processing mill?

Hypothesis

The null hypothesis was tested at 0.05 level of significance and was used as a guide for the study:

1. There is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill.

Scope of the Study

The study is limited to the production of gas powered palm oil processing mill and the various vocational skills used in the fabrication. The study is limited to mechanical engineering students in Federal Polytechnic, Ekowe, Bayelsa State.

METHODS

The work adopted research and development design. The production consist of Frame Assembly, Burner Frame, Gas Burner, Gate Valve, processing unit, Gas cylinder, bearing, shaft, Bevel gear 1, Bevel gear 2, 1.5HP AC Motor, AISC-LI.5*1.5*1/4-12.876, AISC-LI.5*1.5*1/4-12.126, AISC-LI.5*1.5*1/4-65.306, AISC-LI.5*1.5*1/4-25.909, AISC-LI.5*1.5*1/4-64.556, AISC-LI.5*1.5*1/4-65.559, AISC-LI.5*1.5*1/4-25.925, T-joint, Runs 02, Runs 03, Runs 04, Runs 05, Runs 06, Runs 07, Cover, Hooper, Hydraulic Frame, Extraction Unit, Hydraulic Cylinder, Piston, Press Plate, Manual Press System, Collection Unit, Metallic Stand, Metallic Foot, Opening, Grating, hydraulic handling and Extension.

The study used a population of 10 instructors and 23 mechanical engineering students in year two in Federal Polytechnic, Ekowe, Bayelsa State for the fabrication process. The entire population was used as sample for the study. The researchers developed an instrument titled "Students Skill Test in Fabrication"(SSTF). The instrument consists of six items with a four point rating scale. The items are Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). The response options were weighed as 4, 3, 2 and 1. The instrument was subjected to face validation by two lecturers in the department of Technical Education in Rivers State University. The experts comment on language content of the instruments. The instrument SSTF was validated by two experts in Mechanical Engineering Technology in Rivers State Polytechnic, Bori. The validated instrument was administered to four pilot group in the department of mechanical engineering in Uzoro Polytechnic, Delta State. After two weeks interval, the same set of instrument was given to the same students to fill. Their varied responses were calculated using Pearson Product Moment Correlation Coefficient to be 0.87. This was considered adequate for the study.

The research questions were analyzed using mean and standard deviation and while the hypothesis was analyzed using t-test at 0.05 level of significance.

RESULT ANALYSIS

Research Question 1

What is the method of construction used in the production of gas powered palm oil processing mill?

Method of Production of Gas Powered Palm Oil Processing Mill.

Table 1: Description of materials and students skill utilization

S/N	Components/Items	Description of Materials	Method of Production	Nature of Vocational Skill Developed	Students Activities
1	Frame Assembly	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The parts were welded together according to specification. The diagrams were used to observe design and assembly.	Welding skill, cutting skill and filling skill	The students cut the angle irons according to specification, welded the metals and filled the edges
2	Burner Frame	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The frame burner was constructed, welded and joined together.	Welding skill, cutting skill and filling skill	The students cut the angle irons according to specification, welded the metals and filled the edges
3	Gas Burner	Constructed from 4mm thick Alloy steel, 600mm x 1000mm	The gas burners was fabricated and drilled.	Welded skills and filling skills	Students carried out Welding and filling skills
4	Gate Valve	Brass/steel, off shelf	The valve was installed on the equipment.	Installation	Students install the gate valve
5	Processing Unit	Constructed from 2mm thick Carbon steel, 600mm x 1000mm	Machining was done to construct the spine shaft, a base plate was constructed along with sheet metal.	Welding, assembly. Filling and machining	Students Weld, assemble, File and machine.
6	Gas cylinder	Constructed from Alloy Steel 3mm thick, 1000mm x 1000mm	The gas cylinder was installed.	Installation	students carried out installation
7	Bearing	Medium carbon steel, F205 pillow block bearing selected off-shelf	The bearings were installed on the processing unit.	Installation	Students carried out installation
8	Shaft	Alloy steel, 50mm solid shaft machines with shoulder tor bearing	The shafts were turned on a lathe machine.	Machining skill	Students carried out machining
9	Bevel gear 1	Medium carbon steel	The bevel gears were installed.	Installation	Students carried out installation

10	Bevel gear 2	Medium carbon steel	The bevel gears were installed	Installation	Students carried out installation
11	1.5HP AC Motor	Electrical component	The Electrical component were installed	Installation	Students carried out installation
12	AISC-LI.5*1.5*1/4-12.876	Angle steel	The angle iron were installed.	Installation	Students carried out installation
13	AISC-LI.5*1.5*1/4-12.126	Angle steel	The angle iron were installed.	Installation	Students carried out installation
14	AISC-LI.5*1.5*1/4-65.306	Angle steel	The angle iron were installed.	Installation	Students carried out installation
15	AISC-LI.5*1.5*1/4-25.909	Angle steel	The angle irons were installed.	Installation	Students carried out installation
16	AISC-LI.5*1.5*1/4-64.556	Angle steel	The angle irons were installed.	Installation	Students carried out installation
17	AISC-LI.5*1.5*1/4-65.559	Angle steel	The angle irons were installed.	Installation	Students carried out installation
18	AISC-LI.5*1.5*1/4-25.925	Angle steel	The angle irons were installed.	Installation	Students carried out installation
19	T-joint	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
20	Runs 02	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
21	Runs 03	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
22	Runs 04	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
23	Runs 05	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
24	Runs 06	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
25	Runs 07	Hydraulic Hose	The Hydraulic Hose were installed	Installation	Students carried out installation
26	Cover	Constructed from 3mm Mild steel plate, 1000mm x 1000mm	The cover was welded and filled before fitting on the boiling region	Welded skills and filling skills	Students Weld, assemble, File and machine
27	Hooper	200mm diameter cylindrical hopper made from, mild steel plate 3mm thick, 1000mm x1000mm	The Hooper was welded and filled.	Welded skills and filling skills	Students Weld, assemble, File and machine
28	Hydraulic Frame	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The hydraulic frame was welded, filled and machined.	Welding, assembly. Filling and machining	Students Weld, assemble, File and machine

29	Extraction Unit	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The extraction unit was constructed through welding and filling.	Welded skills and filling skills	Students carried out Welding and filling skills
30	Hydraulic Cylinder	Aluminum	The cylinder was machined and installed.	machining	Students Weld, assemble, File and machine
31	Piston	Aluminum	The piston was machined and installed	machining	Students Weld, assemble, File and machine
32	Press Plate	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The Press plate was machined and installed	machining	Students Weld, assemble, File and machine
33	Manual Press System	Alloy Steel Coated	The manual Press system was machined and installed	machining	Students Weld, assemble, File and machine
34	Collection Unit	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The collection unit was welded and filled.	Welded skills and filling skills	Students carried out Welding and filling skills
35	Metallic Stand	Constructed from rectangular steel pipe	The metallic stand was welded and filled.	Welded skills and filling skills	Students carried out Welding and filling skills
36	Metallic Foot	Constructed from rectangular steel pipe	The metallic foot was welded and filled.	Welded skills and filling skills	Students carried out Welding and filling skills
37	Opening	Constructed from mild steel plate 3mm thick, 1000mm x 1000mm	The opening was welded and filled.	Welded skills and filling skills	Students carried out Welding and filling skills
38	Grating	Steel	The grating was welded, filled and assembled	Welding, assembly. Filling and machining	Students Weld, assemble, File and machine
39	Hydraulic Handle	Steel	The hydraulic handle was installed.	Assembly skill	Students Weld, assemble, File and machine
41	Extension	Steel	The extension was Welded.	Welding skills and filling skills	Students carried out Welding and filling skills

Method of Fabrication

Stage 1

Framing and Setting

1. The angle irons were used in framing the structure of the gas powered palm oil processing mill.
2. The angle iron were cut into different section that were welded together to achieve the shape of the processing mill.
3. Spaces were created to accommodate different units of the palm oil processing unit.

Stage 2

Fabrication of Boiling Unit

1. The stainless sheet metal was folded to the required circumference and welded firmly to avoid leakage.
2. The welded joint on the lid and the boiling pot were filed neatly and covered with fillers to avoid leakage when in use.

Stage 3

Fabrication of Separation and Spinning Unit

1. This unit separates the shaft on the kernel from the shell.
2. The rods consisting of shaft angle was created and positioned on 120^0.
3. The base plate was folded and welded firmly to avoid leakage on the base plate.
4. Welded spots were filed with filling machine.

Stage 4

Fabrication of compression unit

1. In this unit the palm kernel and the shaft is compressed to extract the oil from the base plate.
2. An hydraulic compression unit is created and designed with machine tools.
3. This part in this unit requires a lot of machine skills in drilling and creation of holes to allow palm oil to flow to the boiling base plate.

Stage 5

Fabrication of base plate

1. The base plate consists of an open surface made up of steel plate.
2. The steel plate is folded and welded to achieve a pot stand.
3. The base plate has a construction consisting of regulatory valve to allow inflow of compressed palm oil and outflow processed palm oil.

Figure 1: Image of gas powered palm oil processing mill.

Research Question 2

What is the extent of utilization of vocational skills by students in the production of gas powered palm oil processing mill?

Table 2: Utilization of Vocational Skills by Students in the Production of Gas Powered Palm oil Processing Mill

S/NO ITEMS	VHE 4	HE 3	LE 2	VLE 1	MEAN	STD	DECISION
1. Students utilization of welding skill	7	2	1	-	3.6	1.04	Accept
2. Students utilization of assembly skill	8	1	1	-	3.7	1.10	Accept
3. Student utilization of filling skill	6	2	1	1	3.3	0.91	Accept
4 Student utilization of Machining skill	7	1	1	1	3.4	0.96	Accept
5 Students utilization of drilling skill	6	2	1	1	3.3	0.91	Accept
6 Student utilization of cutting skill	5	2	1	2	3.0	0.82	Accept
Grand Mean					3.4	0.96	

Findings obtained from table 2 revealed that item 1, 2, 3, 4, 5 and 6 were all accepted to the various questions. This implies that students utilizes welding, assembly, filling, machining, drilling and cutting skills in the production of gas Powered Palm oil Processing Mill.

Research Question 3

What is the extent of adaptation of vocational skills by students in the production of gas powered palm oil processing mill?

Table 3: Adaptation of Vocational Skills by Students in the Production of Gas Powered Palm Oil Processing Mill

S/NO	ITEMS	VHE 4	HE 3	LE 2	VLE 1	MEAN	STD	DECISION
7.	Students adaptation of welding skill	6	2	1	1	3.3	0.91	Accept
8.	Students adaptation of assembly skill	7	1	2	-	3.5	1.00	Accept
9.	Student adaptation of filling skill	5	2	2	1	3.1	0.85	Accept
10	Student adaptation of Machining skill	6	2	1	1	3.3	0.91	Accept
11	Students adaptation of drilling skill	7	2	1	-	3.6	1.04	Accept
12	Student adaptation of cutting skill	4	4	1	1	3.1	0.85	Accept
	Grand Mean					3.3	0.93	

Findings obtained from table 3 revealed that item 7, 8, 9, 11 and 12 were all accepted to the various questions. This implies that students adaptation of welding, assembly, filling, machining, drilling and cutting skills in the production of gas Powered Palm oil Processing Mill.

Hypothesis 1

There is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill.

Table 4: T-test analysis of difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill

S/NO	ITEMS	N	Df	MEAN	STD	T-CAL	T-TAB	DECISION
1.	students' skill utilization	10	19	3.4	0.96	0.26	1.729	No significant
2.	students' skill adaptation	10		3.3	0.93			

Findings from table 4 revealed that t-calculated value of 0.26 is less than t-tabulated value of 1.729 at 0.05 level of significance. This implies that the null hypothesis was accepted. This means that there is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill.

Summary of findings

The findings obtained from the study can be summarized as follows:

1. Findings obtained from table 2 revealed that item 1, 2, 3, 4, 5 and 6 were all accepted to the various questions. This implies that students utilizes welding, assembly, filling, machining, drilling and cutting skills in the production of gas Powered Palm oil Processing Mill.
2. Findings obtained from table 3 revealed that item 7, 8, 9, 11 and 12 were all accepted to the various questions. This implies that students adaptation of welding, assembly, filling, machining, drilling and cutting skills in the production of gas Powered Palm oil Processing Mill.
3. Findings from table 4 revealed that t-calculated value of 0.26 is less than t-tabulated value of 1.729 at 0.05 level of significance. This implies that the null hypothesis was accepted. This means that there is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill.

DISCUSSION OF FINDINGS

Utilization of Vocational Skills

Vocational skills are essential for students' development in technical fields. The study showed that students utilizes and adapted welding, assembly, filling, machining, drilling and cutting skills in the

production of gas powered palm oil processing mill. Findings also reveal that there is no significant difference between students' skill utilization and adaptation when production of gas powered palm oil processing mill. This findings is in line with the view of Ile, Asoegwu & Chukwugbo (2005) that skill acquisition of vocational skills is needed in the development of individuals who are equipped with the requisite knowledge and skills for productive work life and the development of individuals who are capable of meeting modern technological challenges.

RECOMMENDATIONS

From the findings obtained from the study, the following recommendations were made:

1. Practical materials should be made available to enable students improve on mechanical skills.
2. Lecturers and instructors should lay more emphasis on students' skill development during practical session.
3. Students should be fully engaged on practical projects to enhance their vocational skills in the world of work.
4. Fabrication of gas powered palm oil processing mill should be mass produced by students and institutions for fund generation and students skill development.

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