



# **Machine-Shop Practice Skills Required for Self Reliance in Government Science and Technical Colleges in Bayelsa State, Nigeria**

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**ABSTRACT:** The study ascertained machine-shop practice skills required for self reliance among mechanical trade students in government science and technical colleges in Bayelsa State, Nigeria. The study employed a descriptive research survey design. Two research questions were answered with two corresponding null hypotheses that are formulated and tested at 0.05 level of significance. The target population of the study consists of 137 respondents (112 mechanical trade students and 25 mechanical trade teachers/workshop instructors) from four (4) Government science and technical colleges in Bayelsa State. The study was a census study, a self-structured questionnaire designed in 4 point rating scale of highly required (HR 4) Required (R 3), moderately required (MR 2), and not required (NR 1) from the research questions 1 and 2 was used for data collection. The instrument was validated by two experts in the Department of Vocational and Technology Education and one expert in the Department of Measurement and Evaluation, all in Rivers State University. The reliability of the instrument was obtained using Cronbach alpha reliability method which yielded a reliability coefficient index of 0.86, Data collected were analyzed using mean statistics and standard deviation while z-test statistical tool was used to test the null hypotheses posed at 0.05 level of significance. From the findings of the study it revealed that the two listed items on machine shop skills are required by students of mechanical trade in government science and technical colleges for self-reliance in Bayelsa State. The study thus recommends the need for provision of lathe machines and other milling machines to enhance students' hand-on experience in the operation of various machine components, that would instill them with the required skills in milling work.

**Keywords:** fittings, grinding operation, machine-shop practice, self-reliance, skills, turning operation

## **INTRODUCTION**

An individual needs to developed and acquire necessary skills to enable him meet his own and national aspirations. Unemployment has been identified as one of the major challenges of the 21st century. Nigeria as a nation and Bayelsa state in particular is not spared by the scourge of unemployment. In developing countries like Nigeria, governments and policy makers are increasingly finding it difficult to deal successfully with the problem of youth unemployment. Among other things, this high level of unemployment can be attributed to lack relevant marketable skills that will make them employable in industries or related organizations as well as self-employment (Audu, Kamin & Balash, cited in Ubele & Okwelle 2020). The graduates of technical college are no exemption. As a result, students who graduate from technical colleges acquire little knowledge and practical skills that would enable them, on graduation to practice what was learnt in school, create jobs for themselves to become self reliant as well as participate in economic development (Okafor, 2011).

Technical and vocational job-specific skills relevant for self reliance can be acquired through the system of education offered by technical and vocational education and training [TVET] (Okoye & Okwelle, 2013). TVET is widely recognized as the most effective means of empowering the citizenry to stimulate sustainable national development, enhance employment, improve the quality of life, reduce poverty, limit the incidence of social vices due to joblessness and promote a culture of peace,

freedom and democracy (Okwelle, Beako, & Ajie, 2017). Proper acquisition of TVET skills will in no measure enable its recipients to become self-reliant as such a person will be able to create his or her job after graduation without waiting to be employed by either Government or private establishment. The Federal Republic of Nigeria [FGN] (2013) stated that TVET is used as a comprehensive term referring to those aspects of educational processes involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. TVET is a type of education that seeks to address questions about unemployment. Technical colleges are institutions where students are trained to acquire relevant knowledge and skills in different occupations for employment in the world of work (Emmanuel & Ariyo, 2014).

Mechanical trade at the technical college level is made up of welding and fabrication, panel beating and car body works, air conditioning and refrigeration, Auto electrical works, motor vehicle mechanic works among others. Individuals who acquire skills in any of this trades related areas can establish and manage their private businesses and generate wealth (Okeke & Eme, 2014).

According to Cranmer (2014), skill is an ability and capacity acquired through deliberate, systematic and sustained effort to smoothly and adaptively carry out complex activities or job functions involving ideas (cognitive skill) things (technical skills) and/or people (interpersonal skills). Technical skills are skills expertise or technical competence related to the field of the worker, whether engineering or technical (Medina, 2011). In this regard, Yakubu (2014) stated that the importance of Machine Shop Practice to everyday life and the overall objective of vocational and technical education, that offers training in skill for self-reliance and for employment into the world of work, have made it become an important trade to be taught to students. Therefore, for the students to be trained in machine shop practice skills for self-reliance, self-sufficiency and for employment in the world of work, they require the relevant technical skills in such area like machining process among other. Machining process is a term that evolved over the past one and a half centuries as technology has advanced. In the 18th century, the word machinist simply meant a person who built or repaired machines. This person's work was done mostly by hand, using processes such as the carving of wood and the hand-forging and hand-filing of metal. Therefore, during the Machine Age, machining referred to (what we today might call) the traditional machining processes, such as turning, boring, drilling, milling, broaching, sawing, shaping, planning, reaming, and tapping. In these "traditional" or "conventional" machining processes, machine tools such as lathes, milling machines, drill presses or others, are used with a sharp cutting tool to remove material to achieve a desired geometry (Naberrherm, 2013). Presently, machining (turning, milling, and drilling) is the most widespread metal shaping process in mechanical manufacturing industry. According to Childs, Maekawa, Obikawa, and Yamane (2014) machining include the various processes in which a piece of raw material is cut into a desired final shape and size by a controlled material-removal process. In the industry we have three principal machining processes which are classified as turning, drilling and milling. Other operations falling into miscellaneous categories include: shaping, planning, boring, broaching and sawing. Turning operations are operations that rotate the work piece as the primary method of moving metal against the cutting tool. Lathes are the principal machine tool used in turning. Milling operations are operations in which the cutting tool rotates to bring cutting edges to bear against the work piece. Milling machines are the principal machine tool used in milling. Drilling operations are operations in which holes are produced or refined by bringing a rotating cutter with cutting edges at the lower extremity into contact with the work piece. Drilling operations are done primarily in drill presses but sometimes on lathes or mills. Furthermore, Amaechi, Orlu, Obed and Thomas (2016) explained that graduates of machine-shop practice should be able to carry out operations such as; Fittings, Turning, Milling Metal grinding.

The aims of turning operation according to NBTE (2001) are to train skilled workers with the essential features and the working principles of lathe machines and use the lathes to produce various engineering components with given specifications, understand the basic principles and methods of shearing and apply them in the production of engineering components. The aims of Fitting are Shape metals to size by methods of shearing, sawing and filing, Operate off-hand, and angle grinders to sharpen cutting tools, Drill different sizes of holes precisely on location and perform specialized operations such as reaming, counter sinking and counter boring on the drilling machine, Carry out simple heat-methods of making joints such as soft and hard soldering and Carry out simple tests to demonstrate the properties of materials; after hardness, malleability, ductility, toughness and shear

strength. These milling are to Identify milling cutters; slab, side and face, slotting, angular, etc. Select and mount appropriate cutters onto milling, Machine arbor, adaptors and collar chucks for the horizontal and vertical milling machines, Select and mount work holding devices on milling machine. Work holding devices: milling Vice, plate clamps, dividing head, rotary table and Select and set milling speeds and feeds to carry out a range of milling operations using appropriate cutting fluids. Milling operations: Square right angled faces, mill horizontal and vertical faces, mill stepped faces, mill open-ended and enclosed slots, mill single angle and mill square ended shaft. These skills lead to entrepreneurship development.

The concept of self-reliance does not differ significantly from the principles of self-help and mutual help. The self-help philosophy is closely related to self reliance as defined by Ghari cited in Charles and Lotsmart, (2003) that self-reliance through cooperation is now being promoted throughout the developing world for no egalitarian society should be chronically unable to meet a self-defined, local need. Self-help enables the local people to exploit to their advantage resources, which would otherwise lie dormant and thereby perpetuate the ignorance and poverty of their community, by making use of the under-utilised labor; the instance self-help for community development can increase the competence and confidence of a community in handling its affairs. The habit of self-help is a prerequisite for survival in the modern world (Anyanwu cited in Charles & Lotsmart, 2003).

### **Statement of Problem**

Graduates of mechanical trade are described as craftsmen and master craftsmen who are expected in the maintenance of all types of motor vehicles, machines, generators for the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) in technical colleges (NBTE, 2014). However, Okereke, Bello, and Adamu (2018) stated that these competencies and skills required for the repair and diagnosis of modern motor vehicles, machines and other sophisticated electronic devices is lacking. This situation had made graduates of mechanical trade irrelevant and not responsive in performing their legitimate duties of diagnosis and repair classic cars in the city where many vehicles are seen parked due to technical faults relating to electronic gadgets. Therefore, craftsmen required competencies and skills to diagnose and repair modern electronic gadgets, equipment, automated devices, such as diagnosis and repairs of electronic sensors, actuators, basic technology of modern motor vehicle, and fault diagnosis

Technology Skills required by Technical College graduates Of Motor Vehicle Mechanic's Work (MVMW) in establishing Automobile Enterprises in Anambra and Enugu States of Nigeria, Akegbejo (2017) carried out a study on Metalwork Practice

It is in light of this foregoing, that the researcher delves into this study particularly to investigate, fittings skills, turning skills, milling skills and metal grinding skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State.

### **Purpose of the Study**

The general purpose of the study is to determine the machine-shop practice skills required of mechanical craft Students for self-reliance in technical colleges in Bayelsa State. Specifically, the study sought to determine:

1. Fitting skills required of mechanical trade Students for self-reliance in technical colleges in Bayelsa State.
2. Turning skills required of mechanical trade Students for self-reliance in technical colleges in Bayelsa State.

### **Research Questions**

Two research questions were posed to guide the study;

1. What are the fitting skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State?
2. What are the turning skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State?

### **Hypotheses**

The following null hypotheses guided the study and were tested at 0.05% level of significance:

1. There is no significant difference between the mean ratings of teachers and students on the fittings skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State?

2. There is no significant difference between the mean ratings of teachers and students on the turning skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State?

### **Significance of the Study**

The findings of this study will be of immense benefit to mechanical technology teachers, students, graduates, industries, researchers, government agencies, ministry of education, and Curriculum Planners. The finding of this study will benefit the Federal Government as it will aid her to proffer and adopt measures that will mitigate the challenges confronting machine-shop practice in Technical colleges in Nigeria. The findings of the study will encourage Government and policy makers to make policies that will favor aspiring entrepreneurs, recognized genuinely support the essence of entrepreneurship to nation building.

The study will assist the NBTE in the full actualization of its vision for approving mechanical technology by encouraging periodic review of Technical colleges' curriculum to give room for new and trending technologies that will help students meet up with today's technological demands. The findings of the study will enhance the creation of employment opportunities for self-employed graduates as well as the other young people they will employ. It will bring alienated and marginalized youths back into the economic mainstream and giving them a sense of meaning and belonging. Findings of the study will help to address some of the socio-psychological problems and delinquency that arise from joblessness. It will encourage the youths to develop new skills and experiences that can be applied to other aspects of life, promoting innovation and resilience in youth and through the translation of their business ideas into realities.

The findings of this study, if adopted in to the curriculum of technical colleges in Bayelsa State will produce mechanical craftsmen with the understanding of identification and implementation of adjustments needed in purchase, storage, process, alteration, repair, and salvage operations to assure the inclusion of countermeasures for potential accident and illness related losses in the workshops. Technical colleges' instructors and administrators in Nigeria will find this study useful as it will provide a guideline for new and realistic curriculum designs aid innovations to synchronize with the real world of work. It will help them to adopt pragmatic approaches in instructional delivery. This will bridge the gap between schools.

Furthermore, it will be beneficial to researchers/ scholars who would delve into similar studies as it will serve as secondary data.

### **Scope of the Study**

The study in its geographical scope covered all government science technical colleges in Bayelsa State. The government science technical colleges that were included are Government Science Technical Colleges in Okaka, Government Science Technical Colleges Swali, Government Science Technical Colleges Igta Ewoama and Government Science Technical Colleges Opume. In the content scope of the study, this study was restricted to machine-shop practice skills for self-reliance in technical colleges in Bayelsa State. The following variables formed the content of the study: fittings skills, turning skills, milling skills and metal grinding skills required of mechanical trade students for self-reliance in technical colleges in Bayelsa State.

## **METHODOLOGY**

This chapter describes the method that was be used to conduct the study. The chapter was presented under the following subheadings: design of the study, area of the study, population of the study, sample and sampling techniques, research instrument, validation of the instrument, Administration of the instrument and methods of data analysis.

### **Design of the Study**

The study adopted the descriptive research survey design. Descriptive survey design is a research design which involves interpretation of existing conditions or relationship, opinions, ongoing attitudes, prevailing practices, beliefs, effect that are being felt as well as current phenomenon (Nworgu, 2015). Descriptive survey design is considered appropriate for this study because the study focus on identifying machine-shop practice skills required for mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.

### **Area of the Study**

The study was carried out in government science and Technical College in Bayelsa State. Bayelsa State is a state in the southern part of Nigeria in the core Niger Delta region, between Delta State and Rivers State. According to Nigerian Investment Promotion Commission, (2019), Bayelsa State has a population of about 1,970,500. It has interstate boundaries with Rivers State to the West and Northwest and Delta State to the East and Southeast. The state occupies an area of 9,059 Km<sup>2</sup>. The state is comprised of eight (8) Local Government Areas which include Brass, Ekeremor, Kolokuma/Opokuma, Nembe, Ogbia, Sagbama, and Yenagoa which is the capital city. The major language spoken is Ijaw language. Also, the state has technical colleges with NBTE accredited trades that offer courses on mechanical skills for machine-shop practice. The technical colleges involved in the study include G.S.T.C Igta Ewoama, G.S.T.C Swali, G.S.T.C Okaka, and G.S.T.C Opume in Bayelsa State. The basis for choosing this area was due to the good number of functional technical colleges. The state also houses industries that deal on mechanical craft practices where students would likely seek employment after graduation for self-reliance and to become employers of labor needed in venturing into their own enterprise. Thus, the researcher was certain that adequate sample size, representative of the entire population of would obtain in Bayelsa State.

### **Population of the Study**

The population of the study consisted of 137 respondents which comprises of 112 mechanical trade students and 25 workshop teachers/instructors from Government Science and Technical Colleges Igta Ewoama, Government Science and Technical Colleges Swali, Government Science and Technical Colleges in Okaka and Government Science Technical Colleges Opume.

### **Sample and Sampling Technique**

The sample size for the study comprised of 112 mechanical trade students and 25 workshop teachers/instructors. The study adopted a census (all population) method due to the small size of the population. Based on the assertion of Maduabum (2007), census sampling involves the selection of the entire set of a study's population. Thus, all mechanical trade students and teachers/ instructors offering and teaching machine-shop practice from four (4) government science technical colleges in Bayelsa State were adopted for the study. This implies that no sampling technique was utilized.

### **Research Instrument**

The instrument for data collection was a self-structured questionnaire titled "Machine-Shop Practice Skills required of students for self reliance Questionnaire (MPSRSSRQ)". The instrument was developed by the researcher on different sections (A-D) based on 4-point rating scale of Highly Required (HR 4), Required (R 3), Moderately Required (MR 2) and Not Required (NR 1) from research question one to four.

Section A of the questionnaire elicited information on fitting skills required of mechanical trade Students for self reliance in government science and technical colleges, section B brought out information on mechanical turning skills required of mechanical trade Students for self reliance in government science and technical colleges, section C elicited information on milling skills required of mechanical trade Students for self reliance in technical colleges, while section D identified information on metal grinding skills required of mechanical trade Students for self reliance in science and technical colleges in Bayelsa State respectively.

### **Validation of the Instrument**

To ascertain the appropriateness of the instrument, the research instrument was face and content validated. This process was carried by the researcher's supervisor and two other experts from mechanical technology education in the Department of Vocational and Technology Education, Rivers State University. Copies of the instrument attached with the objectives and research questions of the study were given to research experts for validation. The instrument was validated in relation to: wordings, appropriateness, sentence construction/construct, suitability, relevance and options of the items in relations to the proposed study. The experts' observations and corrections were used to restructure the instrument.

### **Reliability of Instrument**

Cronbach alpha reliability coefficient method was used to measure the internal consistency of the instrument. This method was adopted for this study due to the nature of the instrument. Twenty (20) copies of the instruments were administered to twenty mechanical technology students and technical college teachers/instructors from one technical college in Rivers State who was not part of the

population. The data obtained from these respondents were used to compute the reliability using Cronbach Alpha Coefficient. The reliability indexes for each cluster were 0.83, 0.92, 0.79 and 0.88. Thus, the overall index obtained was 0.86. Hence, the reliability index implies that the instrument was reliable for the study.

**Administration of Instrument**

Copies of the instrument were administered to the respondents by the researcher with the help of two research assistants that were trained by the researcher on the process of administering the instrument. This was to allow for easy administration and retrieval. The instrument was retrieved at the spot to achieve 100% return. Completed questionnaires were collected and used for data analyses.

**Method of Data Analysis**

Mean and standard deviation were used to answer the four research questions formulated to guide the study using Statistical Package for Social Sciences (SPSS). The mean was obtained by the summation of all responses as assigned to a rating scale in an item divided by the total number of responses. Z-test was used to test the null hypotheses formulated for the study at 0.05 level of significance. The benchmark for agreement mean was 2.50 and above hence, any mean below 2.50 was regarded as disagreed while the z-test statistics were accepted the null hypothesis was rejected and the alternate accepted if the calculated z-score (z-cal.) is greater than the z-tab of 1.96; if otherwise, the null hypothesis was accepted.

**DATA ANALYSIS AND RESULTS**

**Research Question 1:** *What are the fitting skills required of mechanical trade students for self reliance in Government Science and technical colleges in Bayelsa State?*

**Table 4.1: Mean Responses on fitting skills required of mechanical trade students for self reliance in Government Science and technical colleges**

S/ N	Statements	Teachers (n=25)			Students (n=112)		
		$\bar{X}_1$	SD	Decision	$\bar{X}_1$	SD	Decision
1.	Ability to carry out the basic principles and methods of shaping metal to given specifications for entrepreneurship development	3.33	0.48	Required	3.21	0.83	Required
2.	For entrepreneurship development to be obtainable, the students requires the ability to assemble machine components and equipment	3.81	0.40	Required	3.05	1.05	Required
3.	Skill to carry out simple tests to demonstrate the properties of materials is required for entrepreneurship development	3.53	1.19	Required	3.13	0.68	Required
4.	Technical knowledge on the operation of off-hand and angle grinders to sharpen cutting tools is a necessity for entrepreneurship development	3.43	1.21	Required	3.31	0.79	Required
5.	Ability to drill different sizes of holes precisely on location and perform specialized operations such counter boring on the drilling machine	3.19	1.36	Required	3.09	0.89	Required
6.	Competency in performing heat treatment processes on metals to impart the desired qualities hardening, normalizing and tempering	3.95	0.21	Required	3.25	0.81	Required
7.	Skill in lapping a given component to a high degree of surface finish and tolerance	3.13	0.58	Required	3.24	1.04	Required
8.	Skills to measure with precision measuring instruments and transfer dimensions with them	4.08	1.07	Required	3.10	0.90	Required
9.	Perform alignment checks for flatness, concentricity, axial alignment and correct anomalies detected	3.20	0.77	Required	3.22	1.12	Required
10.	Knowledge to carry out simple heat-methods of making joints such as soft and hard soldering	3.66	0.48	Required	3.21	0.99	Required
<b>Grand Mean</b>		<b>3.53</b>	<b>0.78</b>	<b>Required</b>	<b>3.18</b>	<b>0.91</b>	<b>Required</b>

Source: Field work, 2022

Table 4.1 showed the mean and standard deviation of mechanical trade teachers and students on fitting skills required of mechanical trade students for self reliance in Government Science and technical colleges in Bayelsa State. From the responses of teachers and students, the study revealed that students require ability to carry out the basic principles and methods of shaping metal to given specifications for entrepreneurship development (3.33 & 3.21), students requires competence in assembling machine components and equipment (3.81 & 3.05), skill in carrying out simple tests to demonstrate the properties of materials (3.53 & 3.13), technical knowledge on the operation of off-hand and angle grinders to sharpen cutting tools is a necessity for self reliance (3.43 & 3.31), ability to drill different sizes of holes precisely on location and perform specialized operations such counter boring on the drilling machine ( 3.19 & 3.09) and competency in performing heat treatment processes on metals to impart the desired qualities hardening, normalizing and tempering (3.95 & 3.25). The study also revealed fitting skills required of mechanical trade students for entrepreneurship development include skill in lapping a given component to a high degree of surface finish and tolerance (3.13 & 3.24), skills to measure with precision measuring instruments and transfer dimensions with them (4.08 & 3.10), perform alignment checks for flatness, concentricity, axial alignment and correct anomalies detected (3.20 & 3.22), knowledge to carry out simple heat-methods of making joints such as soft and hard soldering (3.66 & 3.21).

**Research Question 2:** *What are the turning skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State?*

**Table 4.2: Mean Responses on turning skills required of mechanical trade students for self reliance in Government Science and technical colleges**

S/N	Statements	Teachers (n=25)			Students (n=112)		
		$\bar{X}_1$	SD	Decision	$\bar{X}_1$	SD	Decision
1.	Ability to carry out the working principles of lathe machines and use the lathes to produce various engineering components to given specifications	3.45	.57	Required	3.77	1.14	Required
2.	Ability to calculate speed and gear train for screw cutting	3.20	0.87	Required	3.66	1.11	Required
3.	Aptitude in carrying out the four basic work holding methods and the use of the various work holding equipment for turning jobs on the lathe	3.00	0.67	Required	3.04	1.02	Required
4.	Competence in applying the working principles of turret, automatic and capstan lathes and operate them to produce metal to specification	3.36	0.78	Required	3.52	0.92	Required
5.	Ability to select, grind and mount lathe tools to turn a variety of metals and plastic materials	3.42	1.23	Required	4.11	0.99	Required
6.	Skill required to mount work piece on a center lathe using appropriate methods	3.15	1.49	Required	3.16	1.23	Required
7.	Technical know-how needed to apply basic principles and methods of taper turning and apply them in the production of engineering components	3.96	0.22	Required	3.18	1.18	Required
8.	Skills in selecting appropriate speeds and feeds on center lathe to carry out a range of machine processes on both metals and plastic materials	3.71	0.64	Required	4.27	1.00	Required
9.	Competence needed to carry out drill to a given depth and screw cutting on the machine	3.57	0.60	Required	3.51	1.30	Required
10.	Ability to comply with the general rules for safe practice in the working environment	3.42	0.81	Required	3.48	1.26	Required
	<b>Grand Mean</b>	<b>3.42</b>	<b>0.79</b>	<b>Required</b>	<b>3.57</b>	<b>1.11</b>	<b>Required</b>

Source: Field work, 2022

Table 4.2 showed the mean and standard deviation of mechanical trade teachers and students on turning skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State. From the responses, the study revealed that turning skills required of mechanical trade students include ability to carry out the working principles of lathe machines and

use the lathes to produce various engineering components (3.45 & 3.77), ability to calculate speed and gear train for screw cutting (3.20 & 3.66), aptitude in carrying out the four basic work holding methods and the use of the various work holding equipment for turning jobs on the lathe (3.00 & 3.04), competence in applying the working principles of turret, automatic and capstan lathes and operate them to produce metal to specification (3.36 & 3.52), ability to select, grind and mount lathe tools to turn a variety of metals and plastic materials (3.42 & 4.11) and skill required to mount work piece on a center lathe using appropriate methods (3.95 & 3.76). It was also revealed from the study that mechanical trade students require technical know-how in applying basic principles and methods of taper turning in the production of engineering components (3.95 & 3.18), skills in selecting appropriate speeds and feeds on center lathe to carry out a range of machine processes on both metals and plastic materials (3.71 & 3.27), competence needed to carry out drill to a given depth, and screw cutting on the machine (3.57 & 3.51) and ability to comply with the general rules for safe practice in the working environment (3.42 & 3.48) for self reliance.

**Hypotheses Testing**

The results of the null hypotheses tested are presented in Tables 4.5- 4.8

**Hypothesis 1:** There is no significant difference between the mean ratings of teachers and students on the fittings skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.

**Table 3: Z-test Analysis on difference in the responses of teachers and students on fittings skills required of mechanical trade students for self reliance**

Groups	N	X	SD	DF	$\alpha$	z-cal	z-cri	Decision
Teachers	25	3.53	0.78	135	0.05	1.90	1.96	Accepted
Students	112	3.18	0.91					

Table 3 shows the z-test analysis on difference in responses of mechanical trade teachers and students on fitting skills required of mechanical trade students for self reliance in Bayelsa State. The result revealed that the calculated z-value obtained was of 1.90 while the z-critical value stood at 1.96 at a degree of freedom of 135 and at 0.05 level of significance. Thus, the null hypothesis of no significant difference in the mean responses of mechanical trade teachers and students on fitting skills required of mechanical trade students for self reliance in Bayelsa State was accepted. This however implies that the opinion of mechanical trade teachers and students are in sole agreement regarding fitting skills required of students for self reliance.

**Hypothesis 2:** There is no significant difference between the mean ratings of teachers and students on the turning skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.

**Table 4: Z-test Analysis on difference in the responses of teachers and students on turning skills required of mechanical trade students for self reliance**

Groups	N	X	SD	DF	$\alpha$	z-cal	z-cri	Decision
Teachers	25	3.42	0.79	135	0.05	0.88	1.96	Accepted
Students	112	3.57	1.11					

Table 4 shows the z-test analysis on difference in responses of mechanical trade teachers and students on mechanical turning skills required of mechanical trade students for self reliance in Bayelsa State. The result revealed that the calculated z-value obtained was of 0.88 while the z-critical value stood at 1.96 at 0.05 level of significance; and on a degree of freedom of 135. Thus, the null hypothesis of no significant difference in the mean responses of mechanical trade teachers and students on turning skills required of mechanical trade students for self reliance in Bayelsa State was accepted. This



however implies that the opinion of mechanical trade teachers and students are in agreement regarding turning skills required of students for self-reliance

### **Summary of Major Findings**

The findings of the study were summarized and presented based on the research questions and hypotheses as follows;

1. The study revealed that fitting skills required of mechanical trade students for self reliance in government science and technical colleges include competence in assembling machine components, skill in carrying out simple tests on properties of materials, operation of off-hand and angle grinders and competency in performing heat treatment processes on metals among others.
2. The null hypothesis in Table 4.5 showed the null hypothesis of no significant difference in the mean responses of mechanical trade teachers and students on fitting skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.
3. It was revealed that turning skills required of mechanical trade students in government science technical college for self reliance include ability to carry out the working principles of lathe machines, calculate speed and gear train for screw cutting, carry out basic work holding methods and select grind and mount lathe tools to turn a variety of metals and plastic materials.
4. The null hypothesis in Table 4.6 revealed that there is no significant difference between the mean ratings of teachers and students on the turning skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.
5. From the findings in Table 4.3, the study revealed the milling skills required of mechanical trade students for self reliance include ability to troubleshoot and remedy mechanical faults, mill vice, plate clamps, rotary table, apply working principle of a milling machine, carry out common milling cutters and mount appropriate cutters for milling among other skills for self reliance.
6. The null hypothesis shows there is no significant difference in the responses of teachers and students on milling skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.
7. The study found out that metal grinding skills required of mechanical trade students for self reliance include skills to maintain strict adherence to grinding wheel, demonstrate procedure for wheel turning, dressing and balancing where necessary, demonstrate principle of operating permanent and electro-magnetic chucks and skills in operating cylindrical grinding machine to produce a spindle.
8. Finally, the result of the null hypothesis in Table 4.8 indicated that there is no significant difference in the responses of teachers and students on the metal grinding skills required of mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.

## **DISCUSSION OF FINDINGS**

### **Fitting Skills Required of Mechanical Trade Students for self-reliance**

The study found out that mechanical trade students require fitting skills to carry out basic principles and methods of shaping metal to given specifications, assemble machine components and equipment, carry out simple tests to demonstrate the properties of materials and operate off-hand and angle grinders to sharpen cutting tools is a necessity for self reliance. The findings are in association with Tekkaya (2010) who stated that trainee should be able to shape metals to size by methods of shearing, sawing and filing to be able to work in industries. It was also found out that mechanical trade students require competence to drill different sizes of holes precisely, perform specialized operations such counter boring on the drilling machine, perform heat treatment processes on metals and lap a given component to a high degree of surface finish and tolerance for self reliance. The findings are in line with Degarmo, Black and Kohser (2003) who posited that skills students should develop for self-reliance include ability to understand the basic principles and methods of shaping metal to given specifications and know the various clamping devices used in metal work and apply them as

appropriate. The finding is also in agreement with Groover (2007) who pointed the need for students to develop skills for careful measure of final location of slip coupling to ensure that it is located correctly.

#### **Turning Skills required of Mechanical Trade Students for Self Reliance**

The study found out that turning skills required of mechanical trade students for self reliance include competence to carry out working principles of lathe machines and produce various engineering components, calculate speed and gear train for screw cutting, apply the working principles of turret, automatic and mount lathe tools to turn a variety of metals and plastic materials. The findings are in alignment with Edwards (2013) who listed skills learners should develop to include skills to understand essential features and the working principles of lathe machines for use in producing various engineering components, calculate speed and gear train for screw cutting and understand the basic principles and methods of taper turning and apply them in the production of engineering components. The finding is also in corroboration with Van de Vijfeijken, (2010) select appropriate cutting tools, speeds and feeds on a turret and capstan lathes to carry out a range of machining processes for income generation. The study also found out that skills required of mechanical trade students for self reliance includes skills to mount work piece on a center lathe using appropriate methods, apply basic principles and methods of taper turning in the production of engineering components, carry out drill to a given depth, and screw cutting on the machine and ability to comply with the general rules for safe practice in the working environment. The findings are in agreement with Bulgin (2011) who asserts that trainee should be able to select, grind and mount lathe tools to turn a variety of metals and plastic materials and mount work piece on a center lathe using appropriate methods.

#### **Milling Skills required of Mechanical Trade Students for Self Reliance**

The result from Table 4.3 found out that milling skills required of mechanical trade students for self reliance in technical colleges in Bayelsa State include technical know-how to troubleshoot and remedy mechanical faults, mill vice, plate clamps and rotary table, determine the correct work holding devices and use them for mounting work piece for milling operations and apply the working principle of a milling machine and operate the same machine to produce engineering components. The findings are in agreement with Karbasian and Tekkaya (2010) who stated that the skills that would enhance students' enterprise in mechanical work include ability to understand the working principle of a milling machine, utilize the machine in producing engineering components and understanding the working principles of a plane milling machine. The study also found out that skills in applying the working principles of a plane milling machine and operate the same machine to produce engineering components, carry out common milling cutters, select and mount appropriate cutters onto milling, operate machine adaptors and collar chucks for the horizontal and vertical milling machines are milling skills required for self reliance among mechanical trade students in government science technical colleges in Bayelsa State. These findings are in conformity with the assertion of Mark (2016) that trainees in mechanical trade should be able to select and set milling speeds and feeds to carry out a range of milling operations, use appropriate cutting fluids and mount work holding devices on milling machine industrial expected standard for self reliance.

#### **Metal Grinding Skills required of Mechanical Trade Students for Self Reliance**

The study found out the metal grinding skills required of mechanical trade students for self-reliance in technical colleges to include skills to maintain strict adherence to grinding wheel regulations and safe operational practices during grinding, competence required to demonstrate procedure for wheel turning, dressing and balancing where necessary demonstrate principle of operating permanent and electro-magnetic chucks and operate off hand grinder to sharpen cutting tools. The findings are in agreement with Bulgin (2011) who in a study mentioned that skills to apply safety precaution in the use of grinding machines, skills to understand how grinding machines and their accessories works and knowledge on the composition of grinding wheels, their classification and uses as metal grinding skills required of mechanical students' self-reliance. Finally, the study also found out that skills in operating cylindrical grinding machine to produce a spindle, operate a surface-grinding machine to produce component with parallel, square and angular sides grinding and ability to operate the centerless grinding machine to produce parallel, taper and necked pins and rollers are metal grinding skills required of mechanical trade students in government science technical colleges for self reliance in technical colleges in Bayelsa State. The findings are in alignment with Bombay (2004) who posed for

students to be competence to manage a mechanical enterprise after graduation, they should be able to maintain strict adherence to grinding wheel regulations, carry out the procedures for wheel turning, dressing and balancing where necessary.

### **Summary**

The study was carried out to examine machine-shop practice skills required of mechanical trade students for self reliance in technical colleges in Bayelsa State. The study was centered on mechanical trade teachers and mechanical trade students in four government science technical colleges in Bayelsa State. The variables contained in the study are the “s machine-shop practice skills (independent variables) and students’ self reliance (dependent variables)”. This study was a very significant one as it focused on how to improve students’ self reliance through identifying the skills needed for business venture in mechanical trade. It is believed that identifying the various skills needed would enable school management and other actors in educational sector put more efforts towards actualizing/inculcating these skills on students for self-reliance.

The literature was reviewed under the following subheadings; theoretical framework, conceptual framework, reviews of related empirical studies and summary of literature review. The study anchored on Huffman theory (2002) which classified skill development into three categories that are related to acquiring, organizing and assessing information. On the conceptual framework, concept of machine shop practice in Nigerian technical colleges, self reliance skill acquisition for human capital development and concept of self reliance in technical colleges were discussed.

The study adopted a descriptive survey research design with the use of self-structured questionnaire of forty (40) items to gather information on skills required of mechanical trade students in government science technical college students for self reliance in Bayelsa State. The population of the study consists of 137 respondents which comprises of 112 mechanical trade students and 25 mechanical trade teachers from Government Science Technical Colleges in Igta Ewoama, Swali, Okaka and Opume. No sampling technique was adopted as the entire numbers of mechanical trade teachers and students were used for the study. Four research questions and four null hypotheses were formulated to guide the study. The hypotheses were tested at 0.05 level of significant.

The instrument for data collection was titled “Machine-Shop Practice Skills required for students Self Reliance Questionnaire (MPSSRSRQ)”. The instrument was developed by the researcher on different sections (A-D) based on 4-point rating scale of Highly Required (HR 4), Required (R 3), Moderately Required (MR 2) and Not Required (NR 1) from research question one to four. Copies of the instrument attached with the objectives and research questions of the study were given to research experts for validation. The reliability of the instrument was determined using Cronbach alpha reliability coefficient method which yielded a reliability coefficient index of 0.86. The instrument was administered to the respondents and retrieved at spot. Data collected were analyzed using mean statistics and standard deviation with an acceptance mean value of 2.50 and above.

Based on the data collected, the study revealed that students’ competence in assembling machine components, carryout simple tests on properties of materials, operate off-hand and angle grinders and perform heat treatment processes on metals among others are fitting skills required of mechanical trade students in government science and technical colleges to be able to venture into entrepreneurial activities. It was also found out that turning skills such as ability to carry out the working principles of lathe machines, calculate speed and gear train for screw cutting, select grind and mount lathe tools to turn a variety of metals and plastic materials are required of mechanical trade students in government science technical college for self reliance. Finally, skills in milling and metal grinding are also needed by mechanical trade students for self reliance in government science and technical colleges in Bayelsa State.

### **CONCLUSION**

Based on the findings, the study concluded that students’ competence in milling, metal grinding, fitting and turning are essentials for self reliance. Thus, they need to be instilled with the right skills related to these areas that would enhance their capability to venture into any mechanical enterprise for self-reliance after graduation.

## RECOMMENDATIONS

Based on the findings of the study and the conclusions, the following recommendations were made:

1. Government should make available the equipment and machines needed to integrate practical teaching in government science technical colleges in Bayelsa State. This will enhance students' interest in developing fitting skills.
2. There is need for provision of lathe machines and other milling machines to enhance students' hands-on experience in the operation of various machine components that would instill them with the required skills in milling work.
3. Teaching and learning should be based on real life situation where students are engaged in learning by doing. This method would help install the required skills for students to become self-reliance and be useful to the society they come from.
4. Government science technical colleges in Bayelsa State should be properly funded. This would help in the organization of workshop seminars among students. It will also enable the schools equip the workshop with the needed machines to develop students skills in mechanical trade.

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