

**TECHNIQUES FOR ENHANCING STUDENTS' PRACTICAL SKILLS  
ACQUISITION IN METAL WORK IN TECHNICAL COLLEGES IN RIVERS STATE**

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**Abstract**

*The study examined the techniques for enhancing students' practical skills acquisition in metal work in technical colleges in Rivers State. The study adopted survey research design. The population for the study comprises 120 respondents, made up of 70 Metalwork students and 50 instructors. The whole population was used because of the manageable size of the population. Hence, the entire population was used for the study. The instrument (TESPSAM) for data collection was a structured questionnaire. The questionnaire was structured using the five point Likert scale. The instrument was subjected to validation by three (3) experts. The reliability of the instrument was established to determine the internal consistency of the items using Pearson Product Moment Correlation which gave a coefficient of 0.78. Data collected for the study was analyzed using mean and standard deviation to answer the research questions. The hypotheses was tested using t-test at 0.05 level of significance. Result included an instructional system for improved teaching techniques to enhance students practical skills acquisition in metal work in technical colleges was been developed. On the whole, the developed teaching techniques is a product to be used for instructional purposes and represents a systematic approach to which all salient features of learning and instruction are translated into plans for instructional activities, information, resources and evaluation with attention paid to the consistency and compatibility of practical skills and knowledge.*

**Key words:** *Acquisition, metal work, practical skills, techniques*

**Introduction**

Metal work is an integral part of technical education, which was introduced into the Nigerian education system because of the awareness of its importance for job creation (National Commission for Colleges of Education, 2012). This aspect of education enables students to develop good attitude towards technology and the industry. Through metal work, which is a technical education course of study, students are helped to explore the various areas of technology towards making intelligent career choice, according to Longmans (2003) in Elisha (2014). Metal work according to encyclopedia, is the process of working with metals to create individual parts, assemblage of large scale structure. Metalwork is a field of study that teaches individual how to make use of metal to produce different product for daily needs (Ehimen & Ezeora, 2018).

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Longmans (2003) in Elisha (2014), described metalwork as the activities or skills of making objects. They are creative works made of metals, fashioned by either casting, hammering, joining or combination of other techniques. For Adam (2011), described metalwork as a discipline which aimed at training students on the general properties and use of metal in order to assist them in materials selection for a particular job, train them on how to differentiate the techniques and approaches for a specific work. Metalwork teaches individuals how to utilize the safety rules and regulations in the workshop they work. Metalwork is one of the courses in technical colleges which are aimed at training skilled labour for self reliance.

According to Ehimen and Ezeora (2018), opined that skill is an individual capability to control element of behavior, thinking and feeling within specified content and within particular task domain Golden (2009), opined that skills encompass everything that students need to succeed in the competitive and increasing complex world. This implies the need for effectiveness in the metal work practices. Any enterprise and occupation require that the individual acquires the necessary skills as well establish habit of doing something and it involves the acquisition of skill and attitude to be able to do something well. In metalwork, casting, joining, forming, forging, heat treatment, cutting, sanding and pattern development require skills to exhibit the knowledge to select production stages effectively. Skill acquisition is one of the surest ways through which students can find their ways into the labour Market after graduation either in the public or private sectors. Advances in technology have rendered the basic metalwork skills inadequate for work in metal process industry while creating needs for new and often sophisticated skills. This is because metal products are coming with new devices as a result of technological advancements. With the seemingly rapid growth in metal users in Nigeria today, there is need to improve the skills of the work force needed for metal industry. Amusa (2009), was of the view that, to become a skilled metalworker on-the-job experience is required to understand the symbols and metal properties. In this era of computer, robotic and computer aided manufacturing, More than a basic understanding of the metal work processes is required.

Techniques used for enhancing practical skills acquisition in metal work are those teaching methods used by teachers to achieve the desired learning by students. These techniques are determined by subject matter to be taught and the experience of the teacher. For a particular teaching method to be appropriate and efficient it has to be in relation with the characteristic of the learner and the type of learning it is supposed to bring about. However, for the technique to work, students and teachers must have access to metal work equipment, computers, the internet, tools and materials in their various workshops. Practical work needs application of what has been taught. In order to actualize the learning process by the student, materials to work with must be provided. Techniques for improving teaching and learning of metal work will influence students' behavior and learning process when they use computers, internet and power point presentation. The intent and choice of teaching methods must take into account the nature of the subject matter for what it is going to be used in the interest of the learner. Eric (2013) posited that traditional teaching styles are gradually going extinct with the advent of differentiated instruction, prompting teachers to adjust their techniques toward students' learning needs. Hence teachers must incorporate Computers, the internet, digital presentations, and video teaching techniques with traditional method to enhance teaching and learning of metal work. This is because all learning experiences utilize three domains of Bloom's taxonomy: namely; cognitive, affective and

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psychomotor. This study focuses on the improved techniques for enhancing students practical skill acquisition in metal work in technical colleges in River State.

### **Statement of the problem**

Metal work plays significant roles in all fields of human endeavor. Despite the high expectation of the society from metalwork to achieve self-reliance, the performance of students in this area of study is on the decline. Some of the problems being faced in this area are high cost of tools and equipment needed for setting up metal workshops, hence, a high percentage of metal workshops operate on obsolete tools and equipment, inadequately trained technical instructors, inadequate funds for consumables, and workshop facilities. This suggest that for metal work to effectively play the important role of industrialization of any country and development of the infrastructural facilities for the realization of the country's transformation efforts' there is an urgent need for improved techniques for enhancing students' practical skills acquisition in metalwork in technical colleges in Rivers State . This fact is further buttressed by the low quality of skills exhibited by graduates in task execution and poor performance of students in NABTEB examination in recent times. The poor quality of skills that many of these graduates portray may be as a result of perceived lapses in the techniques for enhancing students' practical skills acquisition among other factors because UNESCO (2007) identified deficiencies in teaching techniques of education in Nigeria as one of the factors that have brought about a mismatch between national aspirations and the quality of products especially in the area of skills acquisition. The absence of an improve techniques in the National Commission for Colleges of Education (NCCE) minimum standard has therefore created a loophole and a huge gap in the courses including metalwork technology. At present, there appears to be some disparities and inconsistencies because of the unguided usage of this techniques with its attendant shortcomings on practical skills acquisition. To this end, the problem of this study can be posed thus: what suitable techniques can be developed as a guide for the teaching and learning of practical skills in metalwork technology at the Government Technical Colleges?

### **Objective of the Study**

The objective of this study is to ascertain the techniques for enhancing students' practical skills acquisition in metal work in technical colleges in Rivers State.

Specifically, the study was designed to:

1. Examine students' opinion about demonstration techniques in the teaching and learning of practical skills acquisition in metalwork..
2. Examine students' opinion about discovery techniques in the teaching and learning of practical skill acquisition in metalwork.
3. Examine students' opinion about computer, internet and digital presentation techniques in the teaching and learning of practical skills acquisition in metalwork.

### **Research Questions**

The following research questions guided this study.

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1. To what extent do demonstration techniques enhance students' practical skill acquisition in metalwork?
2. To what extent do discovery techniques enhance students' practical skills acquisition in metalwork?
3. To what extent do computer, internet and digital presentation techniques enhance students' practical skills acquisition in metalwork?

### Hypotheses

The following null hypotheses was formulated to guide the study and were tested at .05 level of significance.

**H<sub>01</sub>:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in demonstration techniques enhancing practical skill acquisition in metalwork.

**H<sub>02</sub>:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in discovery techniques enhancing practical skill acquisition in metalwork.

**H<sub>03</sub>:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in computer, internet and digital presentation techniques enhancing practical skill acquisition in metalwork.

### Methodology

The study adopted survey research design.. The study covered some technical colleges (metal work craft) in Rivers State. They include Government Technical College Ahoada, Government Technical College, Tombia and Government Technical College, Ele-ogu, all in Rivers State The population for the study comprises 120 respondents, made up of 70 Metalwork students and 50 school teachers. The whole population was used because of the manageable size of the population. Hence the sampling technique was purposive. The instrument (TESPSAM) for data collection was a structured questionnaire. The questionnaire was structured using the five point Likert scale. as Very high extent = (VHE) 5 point , High extent =(HE) 4 point , Moderate extent =(ME) 3 point, Low extent=(LE) 2 point and Very low extent =(VLE) 1 point. The instrument was subjected to validation by three (3) experts. The validators' observations, suggestions, and comments were used to redesigned the final copy of the instrument. The reliability of the instrument was established to determine the internal consistency of the items. The instrument was administered on 20 respondents who were not part of the population. The scores were correlated using Pearson Product Moment Correlation Coefficient. A correlation coefficient of  $r = 0.78$  was realized. Data collected for the study was analyzed using mean and standard deviation to answer the research questions. The decision for including any item in the instructional system therefore required that it must have a grand mean score of 3.50 and above. The hypotheses was tested using t-test at 0.05 level of significance.

### Results

**Research Question 1: To what extent do demonstration techniques enhance students practical skill acquisition in metalwork?**

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S/N	ITEMS	TEACHERS			STUDENTS		
		$\bar{x}$	SD	Remark	$\bar{x}$	SD	Remark
1	Demonstration techniques helps in determining the general physical properties of metals (e.g. hardness, toughness etc).	4.18	0.748	Agree	3.93	1.17	Agree
2	Demonstration technique helps in Identification of different types of precision measuring instruments used in the metal shop.	4.30	0.953	Agree	3.79	1.02	Agree
3	Demonstration technique helps on how to practice measurement using assorted measuring instruments in the metal workshop	4.06	0.978	Agree	4.39	0.982	Agree
4	Demonstration technique help in the use of different types of metal hand cutting tools such as hacksaws, snips.	4.42	0.672	Agree	4.37	0.745	Agree
5	Demonstration technique help in the use of bench shears and cold chisels to cut and shape metal stocks.	4.40	0.782	Agree	4.01	0.857	Agree
6	Demonstration technique enhances students practical skills on operating power saws such as power hacksaw, guillotine, band saws and cold saws to cut metal stocks to sizes.	4.44	0.907	Agree	3.93	1.16	Agree
7	Demonstration technique help in the identification of different types of sheet metals and their gauge classification (sizes)	3.94	1.07	Agree	4.43	0.861	Agree
8	Demonstration technique help in the identification of different types of sheet metal work tools and equipment.	4.26	0.708	Agree	4.39	0.527	Agree
9	Demonstration technique help in the identification of different types of sheet metal joints and demonstrating how to prepare them.	4.16	0.842	Agree	4.17	0.798	Agree
10	Demonstration technique help in the development of patterns of cylindrical, conical and complex shapes in metal workshop.	4.42	0.642	Agree	4.46	0.630	Agree
11	Demonstration technique help in the production of metal joints for various applications.	4.24	0.771	Agree	4.23	0.765	Agree
12	Demonstration technique help in practicing common forging operations using appropriate tools and equipment metal workshop.	4.20	0.881	Agree	4.31	0.808	Agree
	<b>GM &amp; SD</b>	<b>4.25</b>	<b>0.179</b>	<b>Agree</b>	<b>4.20</b>	<b>0.195</b>	<b>Agree</b>

From the data presented in table one, the grand mean of the items range from 4.25 and 4.20. All the items had their mean above 3.50. The standard deviations for all the items are within the same range showing that the respondents were homogeneous in their opinions.

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**Research Question 2: To what extent do discovery techniques enhance students practical skill acquisition in metalwork?**

S/N	ITEMS	TEACHERS			STUDENTS		
		$\bar{x}$	SD	Remark	$\bar{x}$	SD	Remark
13	Observing safety while handling hand tools enhances students practical skill acquisition in metalwork.	4.12	0.799	Agree	4.17	0.761	Agree
14	Observing safety precaution in the use of measurement and gauging tools and equipment enhances students practical skill acquisition in metalwork	4.06	0.767	Agree	4.17	0.798	Agree
14	Identify errors when using marking out tools enhances students practical skill acquisition in metalwor.	4.24	0.797	Agree	4.29	0.684	Agree
15	Identify correctly different types of layout and marking out tools and instruments used in metal workshop enhances students practical skill acquisition in metalwork.	4.42	0.609	Agree	3.99	1.05	Agree
16	Identify correctly, different types of gauges/inspection instruments used in the metal shop enhances students practical skill acquisition in metalwork.	3.98	0.795	Agree	4.19	0.804	Agree
17	Test for squareness of metal surfaces using gauges accurately enhances students practical skill acquisition in metalwork.	3.90	0.886	Agree	4.19	0.921	Agree
18	Test for angular surfaces using gauges accurately enhances students practical skill acquisition.	4.10	0.886	Agree	4.23	0.765	Agree
19	Cut-off metal stocks to correct sizes and shapes using hacksaw correctly enhances students practical skill acquisition in metalwork.	4.36	0.722	Agree	4.37	0.641	Agree
20	Identify correctly, the different types of power cut-off saws/machines used in the metal shop enhances students practical skill acquisition in metalwork.	4.20	0.857	Agree	4.26	0.811	Agree
	<b>GM &amp; SD</b>	<b>4.15</b>	<b>0.166</b>	<b>Agree</b>	<b>4.20</b>	<b>0.197</b>	<b>Agree</b>

From the data presented in table two, the grand mean of the items range from 4.15 and 4.20. All the items had their mean above 3.50. The standard deviations for all the items are within the same range showing that the respondents were homogeneous in their opinions.

**Research Question 3: To what extent do computer, internet and digital presentation techniques enhance students’ practical skill acquisition in metalwork?**

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S/N	Items	TEACHERS			STUDENTS		
		$\bar{x}$	SD	Remark	$\bar{x}$	SD	Remark
21	Industrial visit to metalworking industry that uses computer aided design and manufacturing (CAD/CAM) facilities enhances students practical skill acquisition in metalwork.	4.32	0.713	Agree	4.03	1.00	Agree
22	Operation principles of different types of basic Computer Numerical Control (CNC) lathe and milling machines enhances students practical skill acquisition in metalwork.	3.78	1.16	Agree	3.96	1.11	Agree
23	Operating basic CNC machines to perform simple turning and milling operations enhances students practical skill acquisition in metalwork.	4.10	0.867	Agree	3.77	1.25	Agree
24	Seeing and learning production of simple engineering components or project on CNC lathes and millers in a visit to manufacturing industry enhances students practical skill acquisition in metal	4.44	0.907	Agree	3.93	0.857	Agree
25	Performing drilling operations to produce different hole diameters using CAD enhances students practical acquisition in metalwork.	4.00	0.948	Agree	4.00	0.170	Agree
26	Correcting drilling defects such as off-centre holes using CAD enhances students practical acquisition in metalwork.	4.30	0.544	Agree	4.39	0.804	Agree
27	Setting -up tools, work holding devices and jobs on shaping machines with the use of CAD enhances students practical skill acquisition in metalwork	4.24	0.797	Agree	4.23	0.745	Agree
28	Use of 3D diagram/charts or video films to show the operating principles of milling machine enhances students practical skill acquisition in metalwork.	4.42	0.731	Agree	4.37	0.765	Agree
29	Demonstrating conventional and non-conventional milling techniques using digital presentation enhances students practical skill acquisition in metalwork	4.44	0.765	Agree	4.30	0.768	Agree
30	Operating milling machines to produce simple projects in the workshop with the use of CAD enhances students practical skill acquisition in metalwork.	4.42	0.810	Agree	4.43	0.753	Agree
	<b>GM &amp; SD</b>	<b>4.29</b>	<b>0.226</b>	<b>Agree</b>	<b>4.17</b>	<b>0.213</b>	<b>Agree</b>

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From the data presented in table three, the grand mean of the items range from 4.29 and 4.17. All the items had their mean above 3.50. The standard deviations for all the items are within the same range showing that the respondents were homogeneous in their opinions.

**H01:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in demonstration techniques enhancing practical skill acquisition in metalwork.

**Table 4: t-test analysis of difference between the mean response of metalwork students and that of metalwork teachers in demonstration techniques in enhancing students’ practical skill acquisition in metalwork (Demonstration Technique)**

Group	N	$\bar{x}$	SD	df	t-cal	t-crit	Decision
Teachers	50	4.25	0.179	118	0.014	1.960	Not significant
Students	70	4.20	0.195				

The result in table 4, indicates that there is not significant difference between the mean responses of metalwork students and that of metalwork teachers in demonstration techniques in enhancing students practical skill acquisition in metalwork as the t-calculated is less than the t-critical. The hypothesis is therefore upheld.

**H02:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in discovery techniques in enhancing practical skill acquisition in metalwork.

**Table 5: t-test analysis of difference between the mean response of metalwork students and that of metalwork teachers in discovery techniques in enhancing students’ practical skill acquisition in metalwork (Discovery Technique)**

Group	N	$\bar{x}$	SD	df	t-cal	t-crit	Decision
Teachers	50	4.15	0.166	118	0.015	1.960	Not significant
Students	70	4.20	0.197				

The result in table 5, indicates that there is not significant difference between the mean responses of metalwork students and that of metalwork teachers in discovery techniques in enhance students practical skill acquisition in metalwork as the t-calculated is less than the t-critical. The hypothesis is therefore upheld.

**H03:** There is no significant difference between the mean response of metalwork students and that of metalwork teachers in computer, internet and digital presentation techniques in enhancing practical skill acquisition in metalwork.

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**Table 6: t-test analysis of difference between the mean response of metalwork students and that of metalwork teachers in computer, internet and digital presentation techniques in enhancing students practical skill acquisition in metalwork (Computer, Internet and Digital Presentation Techniques)**

Group	N	$\bar{x}$	SD	df	t-cal	t-crit	Decision
Teachers	50	4.29	0.226	118	0.043	1.960	Not significant
Students	70	4.17	0.213				

The result in table 6, indicates that there is not significant difference between the mean responses of metalwork students and that of metalwork teachers in computer, internet and digital presentation techniques in enhance students practical skill acquisition in metalwork as the t-calculated is less than the t-critical. The hypothesis is therefore upheld.

**Conclusion**

Based on the outcome of the study, the following conclusions were drawn: Firstly, an instructional system for improved teaching techniques to enhance students practical skills acquisition in metal work in technical colleges has been developed. The study provides a study guide for teaching and learning of practical skill acquisition in metal work with regards to metalwork practical processes and operations and organized under the following sequence: specific objectives; learning experiences and activities; instructional methods and techniques or strategies; evaluation methods and techniques and required tools, equipment, machines and other materials for the study of practical skill acquisition in metalwork. On the whole, the developed teaching techniques as a product to be used for instructional purposes represents a systematic approach to which all salient features of learning and instruction are translated into plans for instructional activities, information, resources and evaluation with attention paid to the consistency and compatibility of practical skills and knowledge.

**Recommendations**

Based on the findings the researcher recommends that:

1. Metalwork teachers should endeavour to use the improved teaching techniques to enhance students practical skill acquisition as a guide for teaching the practical skill units of metalwork so as to improve the quality of instruction and enhance adequate content coverage of the metalwork curriculum.
2. The teaching of practical skills in metalwork should be guided by a well defined specific objectives and relevant learning experiences and activities such as the ones identified by this study.
3. Demonstration Techniques, Field trip Techniques, Discovery Techniques and Computer, Internet and Digital presentation Techniques method of teaching should be highly utilized for practical lessons by teachers because of its suitability.

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