ASSESSMENT OF WORKSHOP RESOURCES FOR EFFECTIVE TEACHING AND LEARNING OF FABRICATION AND WELDING CRAFT PRACTICE IN TECHNICAL COLLEGES IN NIGERIA

BY

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A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY IN INDUSTRIAL AND TECHNOLOGY EDUCATION (METALWORK TECHNOLOGY)

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ABSTRACT

The study was designed to assess the workshop resources for effective teaching and learning of fabrication and welding craft practice in Niger State and FCT Abuja Technical Colleges, Nigeria. Five research questions and three null hypotheses guided the study. A descriptive survey research design was adopted for the study. The study was conducted in 4 technical colleges in Niger State and FCT Abuja offering fabrication and welding craft practice. The total of 33 responding consisting of 17 teachers and 16 schools' administrations was used as a total population for the study. A structured questionnaire titled Fabrication and Welding Craft Practice Resources Assessment Questionnaire (FWCPRAQ). The questionnaire was validated by two experts from Industrial and Technology Education Department, Federal University of Technology, Minna and one from Government Technical College, Minna. The reliability coefficient of the instrument was determined to be 0.78 through chronbach's alpha statistics. Mean and standard deviation was used for the research question 3, 4 and 5 while checklist using frequency count was adopted for research question 1 and 2. The t-test was used to test the hypotheses at 0.05 level of significance. The findings of the study revealed that drilling machine and swage block were available whereas the other 25 machines and equipment were not available based on NBTE minimum standard for teaching and learning of fabrication and welding craft practice in Technical Colleges, the finding on the extent of consumable materials available for the teaching and learning of fabrication and welding craft practice revealed that majority of items such as angle grinding wheels, filler rods, parent plates or pipes, solid wires and others were moderately available in technical colleges with grand mean 2.97 and on the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges such as projectors, instructional laboratories (Auto Card), magic board and others were available to a low extent with grand mean 2.07. Based on the findings it was recommended that government, non-governmental organizations and good citizens should ensure to provide the needed workshop resources to help in the production of graduates that will become craftsmen who will be self-reliance thereby contributing positively in our economic growth and development.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Technical education is process of acquiring knowledge and practical skills for the world of work. Ibrahim (2010) postulated that technical education is considered as one of the bases for scientific, technological and economic growth of any nation. Technical and Vocational Education System in Nigeria is designed to produce competent craftsmen for different sector of the economy who are expected to secure employment, become self-employed as well as employ others after graduation (Idris & Mbudai, 2016). In essences, technical education is generally designed to produce knowledgeable and skillful craftsmen who are product of technical colleges.

Technical colleges are institutions established and saddled with responsibility for training craftsmen in Nigeria. Olakotan and Lemo (2019) explained that technical colleges aimed at preparing students for acquisition of relevant knowledge and applied skills in different occupations at the craftsman level. This is geared towards making craftsmen responsive to self and the world of work at large. Numbers of programmes introduces to assists in the attainment of the goals according to Federal Republic of Nigeria (FRN) (2013) includes; painting and decorating, electrical installation work, block laying, bricking and concreting, mechanical engineering craft practice, air conditioning and refrigeration, carpentry and joinery, furniture making and upholstery, plumbing work, motor vehicle mechanic trade as well as welding and fabrication practices.

Welding and fabrication is a vocational programme in Nigeria technical colleges concerns with the forming and bonding of metals to form a useable object or structure. Welding is a way of joining two or more pieces of metal together permanently. According to Dania

et al., (2016) fabrication is the forming of metal, usually steel plate, into various forms either by welding or other forms of metal joining processes; the author further explained that welding is used to cover a range of bonding techniques. National Board for Technical Education (NBTE) (2017) stated that welding and fabrication program in technical colleges in Nigeria is designed to produce the skilled craftsmen with good knowledge of application of equipment, materials, techniques and safety practices in fabrication and welding of metal projects. Welding and fabrication at technical colleges level is offered at two level leading to award of National Technical Certificate (NTC) Advance National Technical Certificate (ANTC) for craftsmen and master craftsmen respectively (FRN, 2000). The trainee upon completion of this programme like any other vocational courses in technical colleges according to (FRN, 2000) shall: Secure employment, set up their own business and become self-employed and employ others which are in-line with the NBTE welding and fabrication objectives.

The objectives of welding and fabrication as contained in NBTE (2017) Include: the ability of student to; carryout gas welding and cutting jobs on all types of metal, produce simple finished structural steel work projects with stick adherence to safety, apply protective coating against corrosion on finished metal projects and market metal projects. The component of welding and fabrication practice are 60% trade related courses, 35% general education and 5% industrial training. Though trainees are enrolled into the programme from year 1 for a full time 3 years progrmme and usually posted to related industries at completion of relevant modules for industrial attachment.

At the level of industrial attachment, welding and fabrication student are supervised, guided and further trained by industrial-based supervisors who are rooted in the art of fabrication and welding. This is done to ensure that welding and fabrication practice students have adequate industrial exposure during the industrial attachment period and

are made to build on the skills acquired in their respective institution (Yisa & Olakotan, 2017). This industrial attachment is expected to carry out in industrial workshop through the provision of adequate workshop resources.

Workshop resources in this study refer to material and human resources such as the infrastructural and physical facilities in the workshops, laboratories, studios and personnel. Ojo (2010) identified workshop resources to include material and human resource needed for the teaching and learning of vocational technical educational programmes in technical colleges. Material resources includes all tools, equipment, machines and the consumable materials that are being used from time to time for teaching and learning of welding and fabrication practice in the workshop. Human resources according to Obomanu and Akporehwe (2011) referred to teaching and non-teaching staff including staff strength, teacher quality, quantity, qualification and experience. Human resources in this study refers to welding and fabrication teachers, administrators, workshop attendants and cleaners needed for teaching and learning of welding and fabrication practices in technical colleges. Hence, for effective teaching and learning of welding and fabrication in technical colleges in Nigeria, material resources such as, tools and equipment are required to be available.

Availability is the degree to which facilities such as machines, tools and equipment are provided in a sufficient numbers or quantity and made ready for used. Availability of assistive technology according to Franco and Andre (2016) is a holistic term which is directed toward education as an entity. Availability in the context of this study refers to the degree to which the tools, machine and equipment used for teaching welding and fabrication in technical colleges. the tools and equipment such as measuring tools, marking out tools, cutting tools, driving tools, forging/ casting tools and holding devices are available in a specified quality for the purpose of achieving the educational objectives.

Hence, for effective teaching and learning of fabrication and welding these tools and equipment must be available alongside with the contemporary to work on consumable materials.

Consumable materials are all supplies that are physically used up in the performance of maintenance. Ojo (2010) postulated that consumables are materials that are utilized or fed into machines as components of the product of production for observable job outcomes. Consumable in the context of this study is those material used in fabrication and welding workshop such as pile, filler wire, parent plate mention but a few which is use in workshop for teaching and learning by qualified manpower.

Manpower is defined as the total of number of individuals who are employed in a company or available for a particular project assignment or work. Adekunle and Lucent-Iwhiwhu (2014) postulated that manpower is the managerial, scientific, engineering, technical, craftsmen and other skills which are employed in creating, designing, developing, managing and operating productive and service enterprises and economic institutions. Manpower in the context of this study are school administrators (principals and vice principals), welding and fabrication teachers and workshop attendants that are directly or indirectly involve in the training of welding and fabrication students in terms of skills acquisition. However, this alone cannot be achieved without instructional resources.

Instructional resources are collection of material including animate and non-animate objects and human and non-human resources that a teacher may use in teaching and learning situation to help achieve desired learning objectives. Hilda and Bernard (2015) explained instructional resources as those resources used by a teacher to simplify their teaching. Instructional resources in the context of the study are those resources or materials which includes visual and audio-visual aids and could either be concrete or non-

concrete for teaching fabrication and welding in technical colleges. instructional resources in the classroom have the potential to help the teacher explain new concepts clearly which resulting in better student understanding of the concepts being taught which can only be effective by functionality of instructional resources. The functionality of instructional resources used in teaching welding and fabrication can be asses by welding and fabrication teachers, administrators and workshop attendances.

Assessment is a form of evaluation that uses collected data to estimate the worth of a programme (Poripo, 2012). Similarly, Ajagbe and Udoy (2018) opined that assessment is the general term which includes all the methods used to gather information about children's knowledge, ability, understanding, attitude and motivation. Obe, *et al.* (2019) Assessment can be defined as the process of judging a person, situation or event. Competency-based assessment is defined as an assessment process that measures the performance of students in knowledge, manipulative skills and attitude in a particular occupational area, which has be shown from different research that technical students lack skills competency which contributes to the factors affecting the poor performance in world of work. It is on this basis that this researcher intends to assess the workshop resources for effective teaching and learning of fabrication and welding craft practice in Technical Colleges in Nigeria.

1.2 Statement of the Research Problem

It is expected that fabrication and welding practice trained students from technical college should carryout gas welding and cutting jobs on all types of metal, produces simple finished structural steel work projects with stick adherences to safety, apply protective coating against corrosion on finished metal projects and market metal projects with high skill proficiency. The trainee upon completion of this programme like any other

vocational courses in technical colleges according to FRN (2000) shall secure employment, set-up their own business and become self-employed and employed others.

It has been observed that fabrication and welding students at technical college levels seem not competent after graduation. This lack of competent led to a decline in the performances of student upon entering into the world of work. Fabrication and welding students are finding it hard to perform effectively in the modern industries because of the lack of required skills needed to perform in the industries. Inadequate facilities for training the students in order meet up with demand of the world of work which may be contributed to by financial problem from the government and also teaching strategies adopted by the teachers in teaching welding and fabrication. This is in line with the view of Umar and Abdullahi (2010) that every training college faces the problem of providing and maintaining suitable workshop and appropriate facilities for technical and vocational training. For the purpose of effectiveness and successful welding and fabrication craft programme in the Government Technical Colleges in FCT Abuja and Niger State, this study is aimed at assessing the workshop resources for effective teaching and learning of fabrication and welding craft practices in Government Technical Colleges in Nigeria.

1.3 Aim and Objectives of the Study

The aim of this study is to assess the workshop resources for effective teaching and learning process in fabrication and welding craft practices in Technical Colleges in Nigeria. Specifically, the study sought to achieve the following objectives:

1. Determine the available machines and equipment for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja.

2. Find out the available hand tools used for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja.
3. Assess the extent of available consumable materials for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja.
4. Determine the extent of available man power resources (academic and non-academic) for effective teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja.
5. Find out the extent of available teaching and learning resources used by teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja.

1.4 Significance of the Study

The findings of this study will be of immense benefit to the following; fabrication and welding practice teachers, workshop attendants, students of welding and fabrication practice in technical colleges, National Board for Technical Education (NBTE), technical colleges, society and National Directorate of Employment (NDE).

The finding of the study will be a great benefit to welding and fabrication practice teachers by knowing the available facilities for teaching welding and fabrication practice in technical colleges and use the knowledge on organizing practical class based on available facilities. When proper facilities and conducive environment are provided for welding and fabrication teacher, the teaching will be effective and also it will encourage the teachers to attend seminars, conferences which will help them to be fit for the purpose.

The finding of the study will be of great advantage to the workshop attendances by having exposure to various modern available machines and equipment. These modern machines and equipment will prompt them to acquire more knowledge in order to be qualified to work with the equipment, machines and tools. The finding will benefit the students if the machines, equipment and tools are adequately available in the school workshop which will enable them to acquire effective knowledge which will aid them to become competent craftsmen after their technical colleges. It will makes them to understand the concept the teachers and trainers is teaching them on time because of the appropriate facilities provided to the schools, it will also makes the students to have conducive environment for study and have opportunity to work on latest machine and equipment. The finding will also benefits the National Board of Technical Education (NBTE) by contribute to the academic performance of the students in both internal and external examination. It has been shown, how poor welding and fabrication students perform in NABTEB, which many writers always emphasis on poor teaching method adopted by teacher which may not only the sources for poor performance, inappropriate workshop facilities may also contributes to their failure.

The finding will also benefit the technical colleges' managements by providing them with infrastructure on proper equipment needed in technical colleges for executing tasks. It will help them to request for updating of the school machines and equipment, to provide conducive environment for teaching and learning to the students. The finding will benefit the society by providing a qualified, reliable, self-reliance craftsmen, that will contributes to the development of the society by fabrication of things to be use and welding of metal through the knowledge acquired during their study. Lastly the study will help National Directorate for Employment (NDE) to produce intensive training manuals or documents for both the employed and unemployed craftsmen and technicians. They can also make

use of the outcomes of this work to generate employability's skills training materials for educating, training and retraining teachers, technicians and craftsmen to enhance their performance and productivity.

1.5 Scope of the Study

The study is on the assessment of workshop resources for teaching and learning process of welding and fabrication practice in Government Technical Colleges in Niger State and FCT Abuja. Specifically, the study will covered workshop resources which include machines, equipment, hand tools, manpower, consumables materials and teaching resources use by teachers in teaching and learning welding and fabrication practice in technical colleges in Niger State and FCT Abuja, Nigeria.

1.6 Research Questions

The following research questions guided the study.

1. What are the available machines and equipment for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja?
2. What are the available hand tools used for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja?
3. To what extent are consumable materials available for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?
4. To what extent are man power resources (academic and non-academic) available for effective teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?

5. To what extent are teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?

1.7 Research Hypotheses

The following null hypotheses are formulated and will be tested at 0.05 level of significance:

$HO_{1:}$ There will be no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of consumable materials available for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

HO_2: There will be no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of man power resources (academic and non-academic) available for effective teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

HO_3: There will be no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Theoretical Framework of the Study

2.1.1 Prosser's theory of vocational education

Vocational Education theory was credited to Prosser (1949). Barlow (1976) affirmed that, Charles A. Prosser was the U.S. father of vocational education. Prosser propounded a comprehensive theory for vocational education in order for it to function effectively and enable an individual to actually carryout some tasks. Prosser is of the view that technical and vocational training would be well-organized in quality if the surroundings in which the trainee is bound for is a duplicate of the surroundings in which he must afterward succeed. Efficient career education can barely be accorded where the instructional responsibilities are conducted in the similar room with the similar tasks, the similar apparatus and similar equipment like in the trade (Prosser, 1949).

Prosser further explained that, career training will be efficacious in quantity as it prepares the person straight and exclusively in the accepted wisdom lifestyle and the scheming habits necessary in the business. Career education will be efficacious in amount as it makes every person to take advantage of his/her willingness, habits and cleverness to the uppermost potential level. Successful occupational learning for any vocation, business, job, military control or work can simply be paid to the chosen group of people who require it, desire it and are competent to survive via it. Career vocational education would be efficacious in quantity since the precise teaching intended for developing the correct lifestyle of acting plus thoughts be recurring toward the dot so as to these practice become fixed to the level required meant for productive exercise. Career vocational training would exist in efficacious amount if the trainers have flourishing understanding in the adaptation

of knowledge and skills of the tasks and operations they embark on to instruct. Each trade, in that location is a least amount creative capacity which a person should have within society to fix otherwise hold work in that line of work. But occupational training must be channeled to that stage among the person, it is neither individually nor communally (Prosser, 1949).

Occupational training have to identify the circumstances like they are in addition to have the prepare persons just before satisfy the desires of the market place. Even though it might be real to add the competent methods of teaching the profession might be recognized, good operational surroundings are extremely suitable. The efficient organization of practice behavior in some scholar will be tenable in quantity since the preparation is specified rest on real job as well as not on training or imitation. The merely authentic basis of package intended for detailed preparation for the job is in the experience of the experts in that line. In any job, there is an evidence of substance which is curious to that professions with which practically have no usable principles in whatever the additional business. Occupational learning will provide efficient societal services in balance since it filled the exact grooming demands of some group by the time that they necessitate it plus in such a manner so as to force out most efficiently gain through the teaching. Occupational training would be generally proficient in amount as in its manners of command and its individual dealings with learner as it brings into thoughtfulness the exceptional uniqueness of some meticulous set of group functions. The management of occupational schooling will be proficient in quantity as it is flexible and flowing relatively than strict and consistent. While each sensible attempt ought to be complete to decrease for each capita price, there is a smallest amount underneath which efficient occupational training cannot be specified, and if the route do not authorize of this least of per capita fee, occupational teaching be supposed not be attempt. This theory is related to the present

study since it emphasizes on the manner vocational education should be given as skill training for individual leaner to function in an occupation and the training areas should be a replica of the real industries where the trainee is expected to work after the training. The theory explained the need to teach the learners with the type of tools and machines they will eventually see in the world of work. That is, the kind of tools, equipment and machines used in the training institution for fabrication and welding craft practice should be the same with those in the industries and other labour market.

2.1.2 Human capital theory

Human Capital Theory (HCT) postulated by Schultz (1961), based on the statement that prescribed training is extremely influential and essential for improving the productive ability of a populace. In fact, human capital theorists argued that trained populace is a productive society. They emphasize how training improved the output in addition to competence of personnel via growing in the degree of cognitive collection of cost-effectively creative person ability, which is a creation of natural ability as well as asset in individual organisms. The supply of conventional training is viewed as an asset in human capital development, which the proponent of the hypothesis contain consider as equal or yet add value than that of substantial assets (Woodhall, 1997). HCT concluded that putting effort in human capital venture would boost economic outputs enormously (Leroy, 2011).

According to Leroy (2011) noted that developed countries education in recent times have been adopting HCT as a principally means for economic development. Human Capital Theory is a major tool for powerful economic drive for education in western countries, laying the structure of management policy ever since 1960. Leroy also noted that HCT is progressively viewed as a central main focal means for economic growth. A fundamental

approach in influencing economic achievement have always been employed as formation of people as human capital and diverse economic descriptions such as industrial changes, making inquiries, invention, production, instruction, as well competitiveness.

Fagerlind and Saha (1997) posit that HCT developed a fundamental explanation meant for huge community expenses rest on training equally in growing and developing countries. The assumption is coherent through the political theories of equality and tolerant develop originate in the majority of western companies. Its demand was founded ahead of the reputed financial gain on asset in learning at in cooperated to the macro and micro ranks. Attempts toward encourage venture in human capital were attributed to product in speedy monetary increase of fellowship. For mortals, such asset was on the basis to gives profits in the course of person financial achievement as well as accomplishment.

The theory emphasizes the need to invest in human capital that will enable the learners to properly establish himself and his nation's economy. The theory recognizes the need for serious commitment in investing in training of human being as they belong to the society. It further recognizes practices on the job and personal participation or involvement through a master who is knowledgeable and skillful through exposure to challenges on the job in the occupation. Based on the illustration above, this theory was found relevant for the study.

2.2 Conceptual Framework

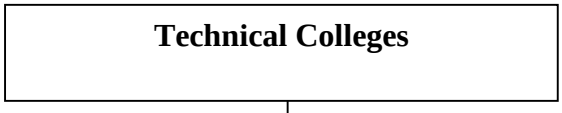

Figure 2.1: Conceptual Framework of the Study

The conceptual framework of this study is based on SDWR for the detail of workshop resources for effective teaching and learning of welding and fabrication practices in technical colleges. Technical colleges aims was to produces craftsmen in different field such as bricklaying and concrete, mechanical engineering craft practices, welding and fabrication etcetera. For effective teaching of this study, there is needs for resources. The resources can be classified as human and material resources, the human resources are those personnel involves in teaching in technical colleges while the material resources are equipment, tools and consumable materials used in teaching welding and fabrication. There are needs for these resources in other to achieve the aims of technical colleges. The

federal government should provide adequate resources to technical colleges in order to produces qualified craftsmen.

2.2.1 Fabrication and Welding

Welding has continued to grow in importance since the Industrial Revolution (White, *et al.,* 2010). Welding is a "joining process that produces coalescence of materials by heating them to the welding temperature, with or without the application of pressure or by the application of pressure alone, and with or without the use of filler metal" (Jeffus & Bower, 2010). In other words, welding is the fusion of two pieces of material by heating the materials to the point of melting and flowing together (Jeffus, 2012; Jeffus & Bower, 2010). Welding is a specialized task that usually requires training and certification of abilities before a welder can work in industry (Cary & Helzer, 2005; Jeffus, 2012; Jeffus & Bower, 2010). Welding is a process of permanent joining two materials (usually metals) through localized coalescence resulting from a suitable combination of temperature, pressure and metallurgical conditions. Depending upon the combination of temperature and pressure from a high temperature with no pressure to a high pressure with low temperature, a wide range of welding processes has been developed (Olubode, 2009). Welders are required to make, join and repair the metal parts for a massive range of machinery, equipment and structures while Fabricators are involved in the creation and repair of either light (water tanks, ducting, metal chains) or heavy metals (i.e. building structures, ships' hulls, bridges). As a fabricator you are likely to specialize in either light metal fabrication including ducts, water tanks, metal chairs, and aircraft parts or in heavy metal fabrication including building structures, ships hulls, and bridges (Majiyagbe, 2009).

Fabricators are involved in the creation and repair of either light (water tanks, ducting, metal chains) or heavy metals (i.e. building structures, ships' hulls, bridges). As a

fabricator you are likely to specialize in either light metal fabrication - including ducts, water tanks, metal chairs, and aircraft parts or in heavy metal fabrication - including building structures, ships hulls, and bridges. As a welder you are likely to find employment in one of the following types of organizations: Architectural, Agricultural, Marine, Transport, Structural, Heavy automotive or General engineering. Students in the welding and fabrication trade course (welding and structural steel) will gain the fundamental skills required to gain employment as a welder. These include skills in: Interpreting drawings, making calculations, Industry safety, Thermal cutting, Arc welding and MIG welding (Olubode, 2009).

Fabrication and welding is a skill based programme designed to equip the students with knowledge, attitude and skills to carry out sheet metal work, gas welding, arc welding and cutting jobs on all types of metals and produce simple finished structural steel work projects (NBTE, 2017). Welding and Fabrication is one of the trade courses offered in the Technical colleges in Nigeria, the trade course prepares the products for craftsmanship training as welder and fabricator. Welders are required to make, join and repair the metal parts for a massive range of machinery, equipment and structures while Fabrication and welding at the technical college level is expected to equip students to a large extent with skills and knowledge in fabrication and welding works (Olakotan & Lemo, 2014).

2.2.2 Teaching Resources

Resources According to Rachel *et al.* (2015), refers not only to teaching methods and materials but also the slime available for instruction, the knowledge and skills of teachers acquired through training and experience. Teaching resources is a source, which provides information required for teaching and learning experience. They further said that it is a

source from which the learner can obtain useful information for the attainment of particular instructional goals. It is anything or anybody to which or whom a learner can turn to for information or help in the process of his learning or goal seeking endeavor (Ojo, 2010). The teaching-learning resources that are primarily used in educational institutions are, textbooks, articles, reports, documents, projects, hand-outs, other reading materials, guides, reference books, models, excursions, field-visits, charts, structures, designs, calculators, computers, projectors, mobile phones, machines, hand tools and internet. These are the important resources that are used by teachers as well as students to achieve desired academic outcomes. When the students have access to these resources, then they can carry out their tasks and activities independently. They are able to complete their class as well as homework assignments and in this manner, an enriched learning environment can be created (Mugure, 2012). The purpose of utilizing teaching and learning resources in class is to assist the teacher with the presentation and transmission of educational content and the achievement of educational objectives, whilst aiding the students in acquiring knowledge and profiling different abilities and values. Therefore, we can list the following examples of their common goals:

i. Student motivation,
ii. Developing creativity,
iii. Evoking prior knowledge,
iv. Encouraging the process of understanding, decoding, organizing and synthesizing the educational content, logical thinking and reasoning, communication and interaction, and
v. Contributing to the development of different skills and the acquisition of values of students, as well as the retention of desirable knowledge, skills and attitudes.

Whether or not these teaching and learning resources will achieve their purpose, role and numerous duties, it all depends, first and foremost, on their correct use within the educational process, which is why it is so important to define the basic principles of the aforementioned process (Busljets, 2013). Teaching resources in metalwork can thus be regarded as all inputs, be it money, material and personnel toward the effectiveness of metalwork instructional programme or every object or material that can be used to facilitate learning in the metalwork studies (Ojo, 2010).

Teaching learning resources are all the things used by the teacher during teaching to aid understanding and make teaching successful and effective. They include modern textbooks, equipment, consumables like chemicals and reagents, models, charts etc. and the physical learning environments which include the science classrooms and laboratories (Omorogbe & Ewansiha**,** 2013). According to Lyon (2012) learning is a complex activity that involves interplay of students' motivation, physical facilities, teaching resources, and skills of teaching and curriculum demands. Availability of Teaching and Learning Resources therefore enhances the effectiveness of schools as they are the basic resources that bring about good academic performance in the students. The necessary resources that should be available for teaching and learning include material resources such as hand tools, machines, text books e.t.c., human resource such as teachers' sand support staff and, physical facilities such as laboratories, libraries and classrooms. Serumu, (2016) classified educational resources into human and material resources.

2.2.3 Human Resources Available for Effective Teaching / Learning of Fabrication and Welding

The human resources are the personnel involved in teaching of physical education in the Schools (Ugwuanyi, 2013). Obomanu and Akporehwe (2011), human resources refer to teaching and non-teaching staffs. Human resources may be said to be the knowledge,

capacities and skills of people needed for the effective participation in the labour force (Ojo, 2010). An educational institution's human resources consist of teachers and other support staff who engage in the process of teaching and learning. They include, laboratory assistants, cooks amongst others. There should be optimum use of the available human resource especially teachers if good performance is to be achieved (Rachel *et al.*, 2015). In terms of human resources required in schools, the most important are the teachers and the students. Human resource indicators include staff strength, teacher quantity, quality, qualification, and experience (Serumu, 2016).

According to Osakwe and Itedjere (1993) humans form the most valuable resources in the teaching of welding and fabrication. They said that "material resources in themselves are not self-instructing but are only intended to be used to supplement normal daily teaching activities directed by the teachers". They referred to human resources as resource persons that may be utilized in enhancing understanding in certain areas of human endeavors. In her work, Ezekoka (2007) said orally that human resources include all the human beings that function to help in the teaching-learning process. A resource person may be within and outside the school community. Examples of resource persons are subject teachers, lecturers, students, farmers and professionals like medical doctors, nurses, lawyers etc. For example, a lawyer can be invited to teach on "crimes: causes, consequences and prevention".

In this context, human resources can include all the human beings that function to aid learning and teaching. The metalwork teacher makes information available to learners. He also suggests alternative source of information to these learners. These learners consult various sources to get relevant information to feed them. In vocational technical education (Metalwork) subject, other member of staff in other vocational field can be a resource person. Fine Art teachers, workshop artisans, school driver, principal who can

give relevant information about some concept in Metalwork can be a resource person. A resourceful teacher can in one way or the other make use of Mechanics, Carpenters, Traders, Farmers and so on, effectively in his cause of facilitating learning. Students feed themselves with relevant information in many occasions about their findings and discoveries. Their finding can be of great benefit to both student and teacher in Metalwork teaching and learning process. (Ojo, 2010).

2.2.3.1 Importance of Resource Persons in Education

Teacher and Students according to Ukadike (2013) both can derive a lot of advantage from resources persons, of which the following are basic:

1. A resource person helps the pupils or students to have a clear understanding of the topic being discussed.
2. A resource person can help to motivate learners. Students are usually encouraged to have interest in teaching when they have something to motivate them. They can be motivated or aspire to become nurses or doctors after they have listened to them.
3. A resource person helps to train and educate the pupils on ways and manners of collecting information as regards their educational career.
4. Learning can be more permanent through the resource person.
5. A resource person helps to widen pupils' experience, for example, different topics are treated by various resource persons and these will go a long way to help in widening their experiences.
6. Critical thinking is developed through the resource person. When a resource person gives a lecture, students are able to develop the ability of positive thinking through listening and asking questions.

7. A resource person (usually a professional) gives pupils first-hand information on the topic that he or she treats.
8. The resource person helps to break the monotony of the class teacher. The class teacher handles the class always, but by bringing in a resource person, the monotony is broken and this helps the learners a great deal, as variety is the spice of life.

2.2.4 Material Resources

Material resources consist of the major tools the teacher employs in transmitting knowledge. They are all the physical resources a teacher uses to help him/her explain or elucidate the topic/content to the learners so that they will be able to comprehend the topic (Egbu *et al.,* 2015). Ukadike (2013) stated that effective teaching and learning cannot take place without adequate and appropriate material resources. To him, the peculiar nature of technical education makes it possible for great variety of material resources to be employed in its teaching and learning.

The material resources in schools are very essential. They are needed for the positive realization of the objective of the organization (Dania *et al.,* 2016). Abijo and Oyekanmi (2017), asserted that school, material resources when provided will aid teaching learning programme and consequently improve academic achievement of students while the models guides their provision to schools could take any form as rational bureaucratic and political model whichever model is adopted according to him, there is always a common feature of differing allocation of facilities to schools.

Material resource management is therefore the process of ensuring that building and other technical systems support the operations of the organization. In most Nigeria public schools especially the primary and secondary, it is a common sight to see chairs and tables littered everywhere in the school premises, broken windows and doors, dilapidated

buildings with cracked walls and leaking roofs, exposed electrical fittings, unkept bushes and lawn as well as a picture of total neglect of the school facilities. This is as a result of insensitivity of staff and students to school facilities as this duty is not assigned to any member of staff (Dania *et al.*, 2016).

Material resources play an integral role in the teaching and learning process as they serve to stimulate thinking, make learning enjoyable, interesting, exciting and concrete (Obomanu, 2011). Dania *et al.*, (2016) Material resource management in schools is aimed at evaluating the physical conditions of existing facilities in schools. It is a tactical planning tool for modernization of the existing facilities; developing the helpful measures for continuous maintenance, reconstruction and rejuvenation. Auditing these material resources is aimed at providing numerical rating for capital planning, with a view to identifying functional deficiencies in building; the nature, expenditure or cost and timing of corrective actions that may be needed to tackle such physical shortage or insufficiency. Material resources include physical size of a school, physical facilities, and instructional facilities such as library, laboratories, and workshops (Serumu, 2016).

2.2.4.1 Types of Material Resources

According to Funsho (2006) material resources could be classified as follows:

1. Reading materials: such as textbooks, story books, magazines, reference books, newspapers, and so on.
2. Visual aids: Such as wall charts, posters, instruction board marker board (modern term for white, black, or chalk board), graphs, flash cards, maps, pictures, diagrams, and so on.
3. Audio aids: Such as radio, tape recorders, audiotape/CDS, and so on.
4. Audio-visual aids: Such as television, video cassettes, VCDs, DVDs, and so on.
5. Artifacts: Such as models, real objects, mock-ups, and so on.

6. Computer resources: Such as computers, computer games, internet services, and so on.
7. Projected materials; Such as overhead projector, multimedia projector, and so on.

2.2.4.2 The Importance of Material Resources in the Teaching and Learning in Education

According to Ukadike (2013) the importance of material resources are:

1. Material resources promote teaching. They help teachers to reduce the amount of talking and thus make their teaching more interesting and successful.
2. They help to bridge the communication gap between the teachers and their students. They help the teachers to make their lessons more explicit to the pupils and students.
3. They allow effective use of teaching time. For example, instead of using many words to describe a sound, objects, or function, the teacher can play a recording of the sound, show a picture of the object or present a diagram of the function. As a result, the learners understand faster.
4. The use of learning/teaching aids assists the recall rate of learners, since they would find it easier to retrieve materials that they saw and read rather than those they simply read. It is also helpful if these materials contain operations which would involve the learners' participation.
5. Material resources create high degree of interest which is necessary in stimulating learning. Pupils and students are usually interested in things that they can see, hear, smell, and touch. Therefore, the attention of the learners could be easily gained through the use of material resources.
6. They also assist teachers to become more efficient in the handling of their subjects and thus, their teaching ability is enhanced.

7. Material resources encourage clear thinking and concentration, for example, pupils like to listen to radio broadcast, television broadcast and watching the cinema with deep attention and concentration.

2.2.4.3 Criteria for Selecting Material Resources in Education

According to Egbu *et al*., (2015) certain considerations should be made when selecting resources for instructional materials for teaching. Some of these factors are highlighted below

Learner Characteristics: Individual differences of learners should be put into consideration. Therefore materials selected should cater for the different learning styles and competence.

1. **Types of Learning Activities:** The tasks and activities for learning would help to determine the type of instructional materials to be selected.
2. **Quality of Production:** Materials to be selected should be of high quality production in terms of clarity of messages, boldness in size of printed letters/numbers/pictures etc.
3. **Medium:** A particular medium must be matched with a type of learning. For instance a learning that requires acquisition of skills will be good for real objects etc.
4. **Relationship of Content to Pupils' Experiences:** Materials should reflect learner's interest, levels of comprehension, age, and maturation level.
5. **Suitability of Vocabulary:** The use of language is important. A material with very complex vocabulary will be of no use to a primary one-school pupil.
6. **Accessibility:** The material should be available, affordable and within the reach of its users.

7. **Durability of Equipment and Materials:** Since materials are supposed to be used from time to time, it is essential that they are durable. For example, a laminated chart will be more appropriate than paper chart.
8. **Ease of Operation:** In cases where schools can afford equipment such as video, projector, and computer, multimedia and so on, preference of equipment to be selected should be based on its user-friendliness. That is, it should be easy to operate.
9. **Cultural Sensitivity:** The materials should not be culturally offensive. Rather, it should reflect culturally acceptable pictures and illustrations.
10. **Gender Sensitivity:** In line with current trends, materials used should reflect issues that promote respect and dignity of both male and female

2.2.4.4 Sources of Material Resources in Education

According to Meziobi *et al.,* (2009) there are a wide variety of sources from which a plan oriented, committed and determined teacher draws the appropriate material resources for his teaching. These are:

1. **Market Sources:** Here commercially produced material resources such as textbooks, hardware and software may be bought from the open markets.
2. **Educational Resource Centers/Places/Libraries:** A number of Educational Resource Centers are available in some tertiary institutions and in most states of the Federal Republic of Nigeria. Students on educational trips are taken to resource places.
3. **Community/Society:** Material resources are plenty in the communities that house our schools. Teachers who are committed to sensitizing the students to real life in their social world will take the students to the resource places in the community.

4. **School's workshop and Laboratory:** Relevant material resources that have been acquired from the market or produced(improvised) by skillful teachers or students/pupils are housed in a school's welding and fabrication laboratory from where they could be taken and made use of, in the classroom setting, should the need arise.
5. **Improvisation:** In the absence of commercially produced, already made material resources, creative teachers can improvise a good number of material resources, given adequate motivation and congenial school climate.

2.2.4.5 Material Resources Available for Effective Teaching / Learning of Welding and Fabrication

In Metalwork, teaching material resources can be classified into; tools, equipment and facilities (Ojo, 2010). **Tools:** According to Olaitan and Ali (1997) are the instruments or devices that can be handled easily while carrying out special operation as well as instructional and learning activities. Tools are commonly utilized in transmitting knowledge in the workshop or on the field, laboratory to the learners. Tools can be categorized in Metalwork into:

i. Measuring tools
ii. Marking out tools
iii. Cutting tools
iv. Driving tools
v. Forging/casting tools
vi. Holding devices.

Measuring tools: These are Steel rules, Measuring Calipers, Try Square, Screw pith gauge and Micrometer screw gauge.

Marking out tools: These are: Marking out table, Vee blocks, spring divider, Center punch, Scribers etc.

Cutting tools: Are Scrappers, Screw extractor, Metric tap and dies, Hacksaws and frame, Chisels, Files (Smooth file, Bastard file, - Triangular, Square, Round, Warden files etc,) Snips (Straight and Curve snips).

Driving tools: These are Harmers – (Ball pein, Straight edge, Sledge, Wooden mallets, Cross pein) etc. **Forging and casting tools:** Smiths hearth, Tongs, Swage blocks, Anvils, Molding boxes, Sand moisture tester, Melting scribe etc.

Holding devices: Bench vice, Tool makers clamp, Machine vice, Pliers, Spanners etc. *Equipment:* These according to Olaitan (1999) are all the portable or heavy instrument or mechanical devices for performing special operation in Vocational Technical teaching and learning situation. Example of these equipment in Metalwork can be Milling machine, Lathe machine, Power hacksaw, Hand drilling machine, Riveting machine, Kiln, Blacksmith furnace, Folding machine, Drilling bits, Soldering iron, Arc-welding machine, Oxy-acetylene etc. *Facilities*: These can be classified into two:

i. *Fixed facility category:* These are the equipment or materials positioned at a particular place for the performance of specified and specialized operation or providing required services. Examples of the fixed facilities are building needed for numerous purposes, workshop meant for woodwork, metalwork, automobile, electrical/electronics operations, home economics laboratories, nurseries, workshop electrification and so on with field equipment.

ii. *Consumable:* Consumables are materials that are utilized or fed into machines as components of the production of observable job outcomes. They are the basic materials required for facilitating skills development activities and practices.

The consumable items for metalwork are: metals in different sizes (Sheet metals, Pipe, Angular bar), Electrode, Rivet pins, Energy cloth, Coolant, First-aid box, Soldering lead, Soldering flux etc.

Other instructional materials that provide information to pupils which afford students the opportunity to see, touch and do are: Audio-visual aids e.g. Projectors, Tape recorder, Multi-dimensional projector, Computer and other electronics devices (Ojo, 2010). Okoro (1993) emphasized that the use of real specimens, models or objects enhance learning. Careful displacement of poster and cartoons, hanged at strategic locations within the laboratory is an effective means of teaching same concept in the metalwork class. Material resources in metalwork are those equipment and materials that capable of transmitting information to learners in order for them to acquire basic skills and knowledge. It consists of equipment, tools, consumable and inconsumable items, charts, machines, textbook and other instructional materials (Ojo, 2010).

2.2.5 Concept of Manpower Planning

Manpower often used interchangeably with "human resources" according to Anyanwu *et al.,* (1997) refers to the "totality of the energies, skills, knowledge and experience available in a country. It is the managerial, scientific, engineering, technical, craftsmen and other skills which are employed in creating, designing, developing, managing and operating productive and service enterprises and economic institutions (Yesufu, 1962). Agabi and Ogah (2010) posit that manpower is the bulk of labour available for any particular kind of work. In a more specific term, "it is the bulk of human beings with the relevant skills, energies, talents, knowledge and attitudes that can be committed towards the production of goods and services (Gbosi, 2003). In Gbosi's view, human beings are not described as manpower or human resources except in that they can be put to some

economic use as a resource that in turn can be used for wealth generation or for the facilitation of increases in wealth. Flowing from the above discuss, it can be asserted that manpower (human resources) are a nation's most valuable resources without which other resources will not give rise to rapid economic growth. According to Unugbro (2012), planning can be defined "as the process of deciding what objectives will be pursued within a future time frame and what will be done in order to achieve those objectives". It involves deciding in advance what to do, how to do it, when to do it and who is to do it (Weihrich *et al.,* 2008).

Agabi and Ogah (2010) define planning as a managerial process directed at the optimal utilization of time and resources in the attainment of clearly identified goals. From the above analysis, planning can be described as a profitable activity directed at the management of human and other essential resources with the aim of achieving an identified set of goals and objectives. Manpower planning has been defined variously by different authors. According to Agabi and Ogah (2010), Manpower (human resource) planning "involves forecasting the human resource needs of an economy, setting objectives that will lead to the realization of such needs, designing strategies for the achievement of the set objectives, identifying resource needs, and defining modalities for plan implementation; manpower planning is the process of determining the policies and programmes that will develop, distribute, and utilize human resources with a view to attaining a nation's broader goals of socio-economic and political development (Anyanwu, *et al.,*1997); it is referred to as "the process by which an organization ensures that it has the right number of people, at the right place, at the right time, doing things for which they are economically most useful" (Ibojo, 2012). Chandan (2005) posits that human resource planning involves objective and systematic assessment of present staffing needs of an organization, identifying the available personnel to satisfy the current needs,

forecasting the future demand and supply of employees, formulating staffing strategies with a view to both short range as well as long range strategic plans and continuously monitoring, evaluating and updating these needs and resources of supply; "it is a rational approach to the effective recruitment, retention and deployment of people within an organization, including, when necessary, arrangement for dismissing staff" (Cole, 2004).

It can be adduced from the above discussion that the essence of manpower planning is to ensure regular and adequate supply and maintenance of relevant human resources in all sectors of the economy, at all times by ensuring that organization guarantees the availability of the right kind of people, in the right number, in the right place, and at the right time. Summarily, employers should have laudable career programmes, establish improved work climates, and above all their personal needs and aspirations should be factor into management decision (Adewale *et al.,* 2011; Helton & Soubik, 2004).

Need For Manpower Planning In Organization

Organization defined by Hitt (1988) is the framework of responsibility, authority and duties through which the resources of an enterprise are brought together and coordinated for the achievement of set goals needs effective planning for its human resources. The need for manpower planning is succinctly expressed in the following excerpt from Psacharopoulos (1991): Skilled manpower is one of the most crucial inputs of modern economic growth and to avoid critical shortages or surpluses of manpower. Planners or decision makers have sought to identify future requirements for skilled manpower and to design the education system so as to produce a labour force with the necessary skill and technical or professional knowledge. Planning is needful because it leads to a more effective and efficient use of human resources. It results in more satisfied and better developed employees because such employees have a better chance to participate in

planning their own careers and to share in training and development experiences which often leads to greater employee satisfaction (Igbinomwanhia, 2010).

Dharamvirsinh and Prashant (2012) and Igbinomwanhia (2010) identified the following benefits that organizations stand to gain by engaging in manpower planning: shortage and surpluses can be identified so that quick action can be taken wherever required; all the requirement and selection programmes are based on manpower planning; it also helps to reduce the labour cost as excess staff can be identified and thereby overstaffing can be avoided; it recognizes the available talents in concern and training programmes can be done to enhance those talents; and with the help of manpower planning, organization can optimally utilize the available human resources to increase the growth and diversification of business. Furthermore, the better able to attract and retain the number of people required with the appropriate skills, expertise and competences; top management has a better view of the human resources dimensions of business decisions; and better planning of assignments to develop managers can be done.

2.2.6 Problems Affecting the Availability and Utilization of Human and Material Resources in Welding and Fabrication Craft Practice

Human and material resources are indispensable ingredients for effective teaching of Metalwork curriculum content for success. It is evident that many of these important ingredients are found wanting in the business of teaching-learning process of Metalwork in secondary school today. Those that are available are not properly utilized for one reason or the other. The following problems are briefly examines as part of possible barrier for the availability and utilization of metalwork teaching resources (Ojo, 2010).

1. Finance and Inadequate Funding:

Finance is central to all other resources in any programme. The volume of money available determines how far other resources can be provided. The availability or lack of

required necessary materials needed from time have an impact on the overall success or failure of a programme (Ojo, 2010). Who lamented that qualitative education requires quality resources and consequently adequate finance. Vocational subject (Metalwork) suffers personnel because no adequate budget provision of fund that for recruitment of more qualified technical teachers and artisans.

The few teachers that available are not better remunerated. The few material resources needed for growths of teaching learning exercise are not make provision for. Many technical teachers have taken the advantage of poor remuneration to have their way to industries for jumbo pay. The few that are remains are demoralized and have taken teaching as option. Tools, machines and other teaching material resources needed to facilitate learning are grounded because of minor fault and lack of simple routine maintenance incentives. Provision of adequate fund cannot be ruled out in achieving full utilization and availability of material and teaching resources for the objective of vocational technical education to be achieved (Ojo, 2010).

2. **Dearth of Qualified Technical Teachers**

There is shortage to trained and qualified technical teachers to handle the teaching of metalwork subjects in most secondary schools. Many schools still engage the unqualified and untrained personnel to involve in teaching of curriculum content. The ability to organize and use facilities work space and equipment effectively in the time available is a technique most teacher needed. But these untrained teachers may claim to posses it but the fact remains that requirements dictated by course objective will be completely lacking. This has led some of these teachers to neglect the use of available material resources that can make their lesson real and fascinating (Ojo, 2010).

3. **Lack of Proper Monitoring/Evaluation**

Lack of adequate information and documentary services have affected teaching materials utilization. Comprehensive account of numbers of tools and materials allocated for Metalwork programme in some school are not available. The teachers and administrators cannot give detail account of available and lost materials, whether replacement is necessary or not. Principals have taken this advantage to ignore the purchase of these valuable teaching resources. Information is an integral part and effective tool for monitoring and evaluating a programme. The technical teacher are rarely taken the stock of instructional materials and forwarded his observation to the school administrators and control agencies. This has created a vacuum to his usage of the material resources (Ojo, 2010).

4. **High Cost of Equipment and Teaching Materials**

Vocational education (Metalwork) subjects need fund to purchase tools, equipment and other teaching resources. Regrettably today is the high cost of these items. This is linked to UNESCO (1985) when discovered that equipment for the industrial fields of technical and vocational education is very expensive. Most of the equipment are imported, which makes it double costly and difficult to maintain because of difficulties in obtaining spare parts.

5. **Language Barrier**

Regrettably is the foreign language of manufacturers of these technical equipment. Machine impetrated from Czechoslovakia and Bulgaria in the early 80‟s were imported with German language which makes it difficult for teachers to operate in the course of their instruction. When little fault arises during ongoing lesson, the machine stop; for the teacher to interpret manual book of the machine and rectify the simple fault and continue his lesson become difficult. The result is that the lesson end up in abstract learning or theory and the machine is completely abandoned (Ojo, 2010).

6. Inaccessible to Efficient Utility

Ojo (2010) explained that Epileptic supply electricity has put many machine and other instruction materials into stop. Many schools have no electricity in their school and workshop to put their machine in operation. Equipment are kept in their positions untouched and to procure electricity generating set powerful enough to supply needed power is difficult.

7. Merging of Vocational Technical Education under the control of administrator who has no knowledge of technical resources.

Olaitan (1996) traced the stunned growth of technical education in Nigeria to the merger of general and technical education. The merger he said result in a situation where the administration of technical education falls in the hand of general educators. It is glaring that the general educator shows bias against technical education. These reflect in many schools time-table where metalwork is only allowed to be taught twice in a week. Not that alone, attention to the needs of technical teacher on instructional materials are always and other likely instructional material as a mere wasting of time and money.

All these highlighted problem areas confirm and justify the anxiety of the researcher in assuming that there are constrains in availability and utilization of teaching resources in metalwork which must be remedied through studies of this kind so that vocational education subject (metalwork) will attain the set national vocational education goals.

Despite importance of human and material resources in the teaching and learning of metalwork technology education in technical colleges in Nigeria, there have been cases of inadequate human and material resources for teaching and learning in government technical colleges. In support, Miller (2011), posited that technical education are being crippled by lack of funds and inadequate infrastructures in government technical colleges.

Aromolaran as cited by Umunadi (2009), noted that the lack of material and equipment was a significant problem in the Nigerian education system (technical colleges inclusive). Most technical colleges in Nigeria are generally ill-equipped for instruction. There are lack good seats and lockers for students to write, and are overcrowded. The standard for learning space is not maintained, teachers seats and staff rooms are out of place, most shutters and doors are already broken to the extent that teachers and student are exposed to danger in hot and cold weather. The facilities that could facilitate learning are not in place (Olaniyonu, 2006). Olaniyonu further pointed out the level of deterioration of standard of schools when Olaniyonu posited that, most of the school buildings today were built some thirty to forty years ago and cannot last for the next fifteen years, because they have not been maintained over the years and are now very old and weak. Apart from not presenting conducive environment for teaching and learning they are death traps for our children whose lives are put at risks. In fact, there have been cases where students lost their lives and some got seriously injured as a result of collapsed of school buildings.

Also, there are situations where skilled personnel are available but no material resources. In some educational institutions, the few resources that are available are old and not properly installed due to lack of funds. There are instances where some resources are available but the teachers are not able to utilize them in teaching and learning process as a result of lack of skills. Also in some of these technical colleges, some modern equipment such as sophisticated sewing machines, computer machines, and wood cutters amongst others are not used by teachers because of their inability to use them (Akinfolarin, *et al*., 2012). Puyate (2002) maintained that the present state of technical education facilities in technical colleges is very poor, there is no planned means of maintenance of the already broken down equipment or means of purchasing new ones, there is little or no concern on the part of government, teachers and students for the improvement of the present state of

facilities. This pathetic situation needs to be reverted in order to meet the goals of technical and vocational education as enshrined in the National Policy on Education of Nigeria. At all levels of the nation's educational system and for all known and existing school types, instructional resources or teaching and learning materials are an indispensable factor in the attainment of goals (Mkpa, 2001).

The study conducted by Onyejemezi (2001) on quality, quantity, production and distribution of teaching resources/facilities revealed that educational institutions are hardly supported with educational resources, even in the face of 'Accreditation fever'. Resource support from foreign countries is no longer available to Nigeria schools. The extent of the deterioration of educational structures such as physical plants, infrastructures and facilities, where these educational structures are available, is amazing. In many schools, the non-availability of these facilities is more striking than their condition (Nnoli, 2001).

Imarhiagbe (1998) further explained that inadequate physical facilities in wood workshops are taking a heavy toll on the quality of graduates produced. Olumese (2004) quoted previous report of National Board for Technical Education (NBTE), as revealing that after visiting ninety one (91) technical colleges across the country to assess their facilities, it was discovered that eight or 1.5 percent had adequate equipment. Musa (1993) decried the level of inadequacy in infrastructural provisions in our technical vocational institutions. Musa further stated that there have been cases where technical students graduate without tools and machines. Offorma (2005) quoted Nwagwu noting that vocational and technical subjects are not effectively implemented as most of the subjects are not offered due to lack of teachers, workshops for practical work, and further noted that where there are teachers the delivery is usually theorized because of lack of

competence on the part of the teacher or due to lack of equipment, thus students graduate without any hands-on experience.

On the factors that can be attributed to the cause of poor implementation of Nigeria curriculum at the secondary school level, Anyanwu (2000) tested a hypothesis which stated that 'there will be no significant relationship between teaching method and implementation of Nigeria secondary curriculum'. 150 participants were involved in the study and the Pearson Product Moment Statistics was used to check if there is a significant relationship between the methods applied by teachers in the class and the consequent implementation of the school curriculum. The result indicated a positive relationship between teaching method and curriculum implementation. The implication of this result is that teachers as one of the main stakeholders of the school curriculum do not seem to promote the effective implementation of Nigeria secondary school curriculum, due to many factors ranging from lack of specialist teachers to lack of teaching materials and non-availability of equipment in the school.

In a similar study by Putsoa (2005), the foremost factors affecting the effective implementation of technical education objectives were also inadequate instructional equipment and the lack of up-to-date school plants. Also, Yusuf (2006) reported that facilities in vocational and technical schools were scarcely available, grossly inadequate and most of them in poor condition. Earlier studies by Ogushi (2008) found that the problems faced by education administrators in the implementation of vocational education programmes in Nigeria include, among other things, incompetent technology teachers.

Nweke (1989), Nwokolo (1993), Ibeneme (1994) discovered that the discrepancy between school workshop facilities and the actual work facilities may adequately account for the amount of retraining given to Nigerian university graduates before they can

effectively perform in the industries. Also, Puyate (2006), reported that most of the equipment's, tools, and workshop facilities are either broken down or damaged or dilapidated. Towe (2007) also reported that there was no evidence of practical work in a course which was supposed to introduce students to various skill-based programmes. Even where workshop and laboratories were available, they were deprived of functional essential tools, equipment and materials.

Consequently programmes that are supposed to be practical are implemented on chalkboards. Fajemirokan (1999) observed that instructional materials are either inadequate in quantity or are obsolete in quality and use. Odusanya (1999) in his study came to the conclusion that teaching of skill- based courses was more theory oriented than a practical oriented one in Nigerian schools. Reasons for this were that tools and equipment were not adequately supplied to go round the students in the practical classes. Accordingly, Olumese (2004), opined that previous report of NBTE which revealed that after visiting ninety-one (91) technical colleges across the country to assess their facilities, it was discovered that eight (8) had adequate equipment.

This above assertion is in line with the work of Abdullahi (2003) that every training school faces the problem of providing and maintaining suitable workshop and appropriate facilities for technical and vocational training programmes. These findings were also supported by Moja (2000) that the problems of Technical and Vocational Education (TVE) in Nigeria are made worse by the poor condition/inadequacy of training facilities. Adequate workshop facilities are necessary for any quality learning to take place. Facilities aid the instructors to communicate more effectively and the learners to learn more interestingly, meaningfully and permanently.

According to Osarenren-Osaghae and Irabor (2012), a survey report by the National Education Research Development (NERD) of the state of demand and supply of science

and technology teachers nationwide indicated that about 320,000 representing 88% of the total needs were not available in 23 different subjects. A similar survey by NERD (2004) in respect of polytechnics indicated a shortfall of 88%. This is in line with Agbenten (1985) who discovered that shortage of qualified teachers is a worldwide phenomenon but more obvious in the developing countries where educational systems are constantly expanding without sufficiency of qualified teachers.

In support of this statement, Udofort (1994) lamented that insufficient qualified sciences and technology teachers in schools have often resulted in the employment of unqualified people and this de-motivates the students through bad teaching. Aina (2000) states that the quality and quantity of teachers in the schools have contributed immensely to the high failure rates being experienced in the programmes run by National Business and Technical Examination Board (NABTEB) certificate examinations.

In a study carried out by Edobor (2007) regarding the availability of human and material resources in vocational courses, in secondary schools in the southeastern parts of Nigeria, the discoveries were in line with Odunsanya (2006), Aina (2000) and NERD in Osarenren-Osaghae and Irabor (2012), confirming the inadequacy of human and material resources in the teaching and learning of vocational courses. In same vein, Omorogbe and Ewansiha (2013) citing Ogunmade stated that majority of students does not have textbooks and most of the schools do not have libraries and where they have one, the textbooks in the libraries are outdated. However, in most of our schools, there are no facilities for the teachers to demonstrate phenomena, let alone allow the students to have opportunities for finding out things for themselves Omorogbe & Ewansiha, 2013).

Challenges of implementing welding and fabrication Curriculum in Nigerian Technical Colleges

The challenges of implementing woodwork curriculum in Nigerian technical colleges are synonymous with the problems of general education in Nigeria. Egwu (2009) posited that some of the major challenges of the Nigerian education system (metalwork technology education inclusive) includes;

I. Inadequate and obsolete infrastructure and equipment, for example poorly equipped woodwork technology education workshop and libraries, dilapidated classroom blocks.
II. Inadequate capacity in the institutions for internal/peer quality assessment.
III. Weak support structure for students Industrial Work Experience Scheme (SIWES)
IV. Brain drain, human capital flight
V. High incidence of cultism, examination malpractice and social and academic vices.
VI. Unstable academic calendar
VII. Staff shortages across board
VIII. Unattractive conditions of service for technical college teachers
IX. Inadequate funding of educational institutions.
X. Inadequate collaboration between educational institutions and organized private sector.

However, Udoka (2010), opined that the major challenge is funding. In same vein, Yusuf and Soyemi (2012), posited that inadequate financing is one of the problems of implementing technical education curriculum (Welding and Fabrication technology curriculum inclusive) in technical colleges. Furthermore, Okoroafor (2010), also noted that; some of the problems of implementing technical education curriculum include;

i. Lack of sponsorship: Management of educational institutions find it difficult to sponsor the technical teachers/lecturers to seminars, conferences, and short

courses claiming that there is lack of fund. This has reduced the rate at which the technical teachers/lecturers are upgraded.

ii. Inadequate infrastructure: Technical teachers/lecturers do not have the opportunity to put what they have learnt into practice due to lack of infrastructure.

iii. Inadequate Timing: Time should be provided for technical teachers/lecturers to go and upgrade themselves. Work load should not be so demanding that they preclude technical teachers/lecturers from research and time to develop new skills, abilities and knowledge through research and innovation.

iv. Lack of reward for excellence. However, Nwogu and Nwanoruo (2011), stated that the challenges of technical education are numerous, which include lack of skilled manpower; acute shortage of technical teachers; and poor funding of technical education.

Consequently, Odu (2011) posited that the following challenges confront the implementation of Technical Teacher Training Programme in Nigeria. These include insufficient material resources for training; dearth of qualified TVET educators; and the use of the quota system for selection of students in TVET teachers training programme.

In same vein Odu (2011) stated that, some of the challenges of Human Capital Development include inadequate funding; poor workshop organization; and inadequate instructional materials. Others challenges as posited by Okebukola (2012), include teachers inadequacies; funding inadequacies; gross Inadequacies in facilities; harsh and intimidating classroom; poor quality preparation of lesson by TVET teachers; resource inadequacy; unhealthy classroom; shortage of equipment; and social vices. According to Mohammed (2005), one of the problems of Technical and Vocational Education in Nigeria is the lack of motivated teachers and the reason for this lack of motivation could easily be traced to the low esteem of the teachers. More so, lack of funds on the other

hand affects other essentials needed in the implementation of technical education like the provision of teaching aids, furnishing of offices, laboratories, workshops and even basic infrastructures like classroom, seats and tables, so that a common sight to find students of architecture for instance sharing a table where each ideally should have one because of the technical nature of their course. Ekpenyong (2011) posited that, there are a number of factors, which have in various proportions impeded the smooth implementation of the goals and objectives of technical education. Some of the outstanding factors affecting the implementation of technical education include inadequate supply of technical teachers and equipment, misinterpretation of policy and public perception of technical education, technical college-industry relationship problem, poor condition of services of technical teachers, and inadequate guidance and placement services for technical students. Accordingly, the National Board for Technical Education (NBTE, 2011), opined that, the underlining challenges of technical education sector include; low societal recognition, which translate to low enrolment and inadequate skilled workforce, obsolete instructional facility, inadequate funding, poor staffing, poor linkages with industry and general deficiency in quality. In addition, evaluation in all sectors of education tends to be by conventional examinations, which generally does not factor in practical techniques in the industry. There are numerous challenges facing technical education in Nigeria. According to Aigbepele (2011) these challenges include;

i. Negative public attitude towards technical education. Aigbepele further stated that, most people see technical education as inferior and therefore will not want their ward to go into profession.
ii. Inadequate basic infrastructure facilities, workshops and laboratory.
iii. Inadequate funding of technical education.
iv. Inadequate and ill-equipped technical education staff.

v. Irregular review of the curriculum for technical education.

Similarly, Lilly and Efajemue (2011) reported that there are many challenges worthy of noting. Some of these challenges include; poor planning, obsolete curricular/infrastructure, very low enrollment, very poor teaching learning environment, and poor quality of academic staff, poor library facilities, poorly/ill equipped laboratories and lack of political will. Also, Okorafor and Okorafor (2012) stated that poor implementation, low enrollment, gender disparity, quality of infrastructure and poor public perception are constrains and challenges of technical education in Nigeria. Okwori (2012) disclosed that lack of equipment in schools will make our students not to have ample opportunities to see and manipulate them in order to acquire the necessary knowledge and skills while Imarhiagbie (1998) further explained that inadequate physical facilities in wood workshops are taking a heavy toll on the quality of graduates produced. According to Okwori (2012) physical facilities such as workshops, machines and tools are not enough. These inadequacies affect students' performance in both theory and practical work. This means that the objectives of technical education will be difficult to achieve.

Moreso, the general problems of technical education in Nigeria include: limited resources, lack of guidance services, inadequate training of technical teachers and the lack of teaching resources (Moja, 2000, Olumese, 2004; and Nwokomah; 2005). Other challenges according to Yusuff and Soyemi (2012) includes, low quality training, mismatch between training and labour market, skill discrimination against graduates of technical schools, low enrollment at all levels of technical education, weak monitoring and evaluation and inadequate financing.

Uwaifo and Uwaifo (2009) reported that the problems of training technical education teachers in Nigeria are funding problem, inadequate physical/material resources, mal-

administration, insufficient and poorly qualified technical staff, gross neglect of technical education, and poor training and re-training programme. Scholars have identified major problems facing technical colleges from various assessment studies to ascertain the status of human and material resources for teaching and learning trade courses (woodwork inclusive). In support, Okorie (2000) reported adequate training facilities, qualified technical instructors and funding are becoming very scarce in training institutions. In Nigeria, technical colleges are hardly able to get enough instructors and fund to render their facilities to keep pace with technological progress. However, infrastructures in technical colleges today reveal that some schools do not even have a defined workshop where students can practice what they learn (Boyi, 2008). Some buildings have had their roofs removed, windows and doors pulled out, no desks for students to sit comfortably and learn.

A critical assessment of government technical colleges in Nigeria revealed that some machines supplied by the federal government as far back as 1982 to technical colleges are still lying in crates (in some cases outside) for lack of workshops to install them. Parts of these machines have depreciated; others have disappeared over night or converted to personal use by domestic thieves (Ekunke, 2008). In some cases, the few machines available have become too old to be used or have broken down due to lack of maintenance. Facilities that are functioning have no electricity to power them. Aggarwal (2006) commenting on the vital role of the teacher puts it succinctly by positing that premises and equipment are needed in the education enterprise and persons are vital to them and a teacher is the supreme factor. There is no exaggeration that a spacious building, costly equipment, and a sound syllabus will serve some useful purpose only when there are teachers who are fully alive to the nobility of the profession and its accompanying responsibilities. In the same vein Buseri (2010) posited that to meet up with the rapid

scientific progress in technology requires the presence of well trained, efficient, knowledgeable and skillful teachers who are versatile in the discharge of their duties and responsibilities. In Nigeria, the Federal Government does not mince words when it declared that "no education system can rise above the quality of its teachers (FRN, 2004). The availability of adequate and qualified teachers cannot be compromised for the success of woodwork technology education in government technical colleges in Nigeria. Federal Ministry of Education, Science and Technology 1985 decided to enhance the academic performance of students in different institution by equipping the schools with standard equipment (Umunadi, 2009). Umunadi (2011), stated that facilities which include the buildings, equipment, tools and school materials available are inadequate for effective use in schools. One of the major problems in technical colleges in Nigeria is lack of materials and equipment. In same vein Oranu (1990) stated that lack of physical facilities is the problems of educational institutions (technical colleges inclusive) in Nigeria. On the problems existing in the schools and the system of education, it is lack of materials and necessary equipment in teaching science and technology subjects (Umunadi, 2009).

2.2.7 Enhancing Adequate Provision of Teaching Resources in Metalwork.

As earlier discussed, teaching resources is classified into human and material resources, to enhance adequate provision of these resources the following should be considered.

1. Human Resources

No educational system can rise above the level of its teachers. While many laudable educational initiatives failed is because they do not take due account of the "teacher factor" (Adewuni 2000). Teachers are the pivots of achievement in many educational set objectives. At a three-day workshop organized by Education Tax Fund to deliberate on Nigerian education future, virtually all observations made were related to the failure of Human and Material resources available to cope with the demands of the educational

process (Igborgbor, 2000). Then it can be concluded that teacher supply, provision of physical facilities and equipment, among others are significant factors to the issue of resources in the implementation of vocational education programme in secondary schools. However, it is generally argued that any question raised concerning resources quickly conjures a picture of demand for more funds. While money is important in the provision of resources, Banjo (1990) asserted that Teachers are the most important factor of any educational system. The system, he says is as good as the teachers who operate it. The introduction of Technical Teacher Training Programme (TTTP) is a right step in right direction but there is need to strengthen the programme by more adequate funding and good legislative backing to make the system more productive. Regular training and retraining of technical teacher is another motivational technique that make teacher feel involved. From time to time, every devoted or steadfast teacher should be exposed to new ideas, method, and techniques through in-service training, workshop, conferences seminars and so on both at home and abroad. Thereby, he will gain knowledge and professional growth.

To prevent technical teachers exodus from teaching in the classroom, effort should be made to retained or encouraged the few ones in the classroom by given them special allowance, special package that will allow them to compete with their counterpart working in the industries (Ojo, 2010).

2. Good Monitoring/Evaluation

The Federal Republic of Nigeria (FGN, 2013) stated that the objective of supervision in vocational education is to ensure quality control through regular inspection and continuous supervision of instructional and other services. The process will extends to the administrative control of teachers instructional activities, the delivering system available, facilities, and the instructional problem of teachers as well as the problem of learning

environment. Workshop is the center of instruction in the Vocational Technical Education subjects, hence the principal and other agencies involved (Ministry of Education Science and Technology Division) should belt up and learn to direct much of his attention towards the classroom/workshop in order to be aware of happenings there. Various reasons for carrying out supervision in school are enumerated by Serumu (2016); these include:

i. Knowing the teachers performance.
ii. Improving teacher competency.
iii. To discover special abilities and qualities posses by teachers.
iv. Providing guide for staff development.
v. Knowing the effectiveness of workshop practice embarked upon teachers.
vi. Evaluating the goals of the school.
vii. To identify and provide for urgent needs for instructional activities.

Material Resources

1. Improvisation

Presently, teaching resources available have not been able to match up the needs of classroom activities in the schools. The only option left for teachers is to improvise. Improvisation according to Nneji (1999) is a lubricant that is needed to oil the wheels of technology education.

Training technology teachers has to strengthen the improvisation capabilities of the trainees. Nneji (1999) being able to improvise enable a teacher to among other relate the subject to social realities and thus excite and inspire the children and hence ensure and inspire the children and hence ensure that they are attracted to the subject. Improvisation is another impetus to secure adequate instructional teaching resources in the school.

2. Loan

Other alternative for enhancing teaching material resources is by borrowing from learning resources center. A learning resource center according to Ojo (2010) is a typically a collection of all forms of learning resources together with some equipment for their manufacture and use by students and teachers. It is a library of resources which contain instructional material and other sophisticated three dimensional objects, such as video-tapes, projectors, audio-visual etc. The teacher borrows any instructional material needed to reach any content of his choice and return same to the center. The teacher can also go to nearby school that may also have more than enough materials for borrowing.

3. Involvement of PTA/Private Agency

Physical and material resources such as libraries, laboratories, workshop and other instructional materials can be provided through the help of local communities. The Parents/Teachers‟ Association and some philanthropies can be mobilized for the provision, construction, selection and maintenance of educational infrastructure and facilities. Fund could be sourced from Community Development Associations, Women Groups, Trade Unions and Voluntary Agencies through persuasion for provision of adequate teaching material resources (Ojo, 2010).

2.2.8 Instructional Resources use for teaching and learning

Print materials *Non-Print Materials*Community resources- Textbooks- Teachers guides Supplementary readers Electrically Operated Non-Electrically Human, Non-Human-Magazines - Computer Operated - Professionals- Place of - Newspapers - Slide - Charts - Non -interests- Dictionary - Radio - Models Professionals- Physical- Encyclopedia - Television – Posters features- Poems - Overhead Projector - Graphics- Maps - Films - Games- Short stories – Film projector - Pictures- Pamphlets - Tape recorder - Globe-Bulletin - video tapes – Printings. Film strips - Flannel board- Real Objects (Ololobou, 2010).

Print Materials:-

These are also referred to as reading materials. Individuals go through them to gather information about people, places, processes and events. In the class, they can be used to provoke general class discussions or raise issues for in depth class analysis. The class textbook is a basic material for the welding and fabrication class. However, the natures of technical education require broad and current knowledge. Therefore, the teacher need to expose the learners to other print materials such as encyclopedia, new magazines, pamphlets, poems, supplementary readers, tools , equipment and machines. In using them, teacher should not turn the class into a reading session even though developing reading skills is important. These materials should be used to:

i. Provide organized subject matter for learners to study.
ii. Develop the skill of identifying needed information on a variety of issues person and processes.
iii. Solve identified group problems to suggest rational solutions.
iv. Stimulate thinking and interest (Edinyang & Effion, 2014).

Instructional materials for teaching and learning in technical colleges are as followings

1) **Textbook**: Textbook as the main learning source at schools does not always satisfy teachers and learners for some possible reasons. First, some published textbook for classroom used do not have audio recording or video for listening practices other than the teachers' voice. Learners can improve their listening skills if they are exposed to more authentic listening materials such as video of English conversation using American, British or other accents. It provides perfect opportunities for learners to hear the target language in a more natural setting so that they can acquire good speaking habits (Harmer, 2007). Second, textbook's cultural content sometimes is inacceptable to some group of community. Teachers

in this condition need to supplement the textbook with other relevant materials. This process of supplementing materials needs special skills to select and adapt the most appropriate content for learners.

2) **Graphics** or **two-dimensional materials**: Charts are used graphically to illustrate various steps in the introduction process. Chart such as flip charts, strip charts, time and sequence charts etc. and graphs such as pictorial graphs, simple bar graphs, maps, atlases, cartoons, comics, posters billboards are all two dimensional materials in which they represent information in order to give out a vivid visual impression of the information been conveyed to the learner and to simplify complex ideas and concepts. (Mezieobi, 2008). These materials are ideal for school students considering their age, development abilities and capabilities.
3) **Equipment and machines:** This help the students to exposed to the skill needed in the world of work. Proper using of the tools, machine and other equipment by teacher make the students to understand the concept of the work properly. It also make the teacher work easier.
4) **Improvised Materials:** The National Teachers Institute (NTI) (2006), defined improvisation as the making of substitute from local materials when the real or original equipment is not available. In other words, improvisation is the act of designing and producing instructional materials from locally available resources by the teacher and utilizing such materials to facilitate effective instruction in the classroom. Improvised materials might include motivation models of an airplane, wall clock, or bird using cardboard sheets, sticks, carton etc.
5) **Library:** Library is a good source of getting information of every kind. A library is normally a building or a room containing a collection of books and periodicals for use by the public or the members of an institution. A teacher can make the

best out of the library by perhaps organizing study trips to the library to mobilize learner's to assist in the collection of some materials and participate in making the materials that can be kept at the library for use.

6) **Internet:** With the recent development of our country and the world at large, the internet is one of the best, fastest and up-to-date source of conveying information be it in a real life picture form or in text (written) form. Teachers can make use of the internet to search for the most recent information from all over the world and even make students search for information themselves from the internet when available at their schools. This will help enrich the teacher's knowledge as well as the students' knowledge of the most recent changes and activities of not only their environments and country but also the world at large.

    i. **iTunesU,:**It is the ideal of resources for educators who want to gain insight into curriculum being worldwide, get access to primary resources and find inspiration for enhancing teaching and learning with technology. iTunesU is one of the resources that over 800 universities are having access to iTunesU sites and nearly half of these institutions including Stanford, Yale, MIT, Oxford and UC Berkeley distribute their content publicly on the iTunesU store. In addition, cultural and education institutions, such as the Library of congress public broadcasting organization and state departments of education, it also contribute to this growing education content responding.

    ii. **Audio-visual materials:** Radios, television are very important instructional resources in welding and fabrication teaching and learning, because of the impact of value and impression they have on people (Alaezi, 2009).

2.3 Review of Related Empirical Studies

Ojo (2010) conducted a study to evaluate the human and material resources for teaching Metalwork in the secondary schools in Ekiti State. Six research question and six null hypotheses guided the study. A descriptive survey research design was adopted for the study. The study was conducted in 32 secondary schools in Ekiti State. A total of 128 respondents comprises of 92 Metalwork teachers and 32 School Administrators (Principals) in the secondary schools in Ekiti State. A Structured questionnaire developed by the research and validated by 3 experts was used for data collection. The reliability coefficient of the instrument was 0.82 using Cronbach Alpha. The data was analyzed using mean, standard deviation and t-test. The mean and standard deviation were used to answer the six research question and t-test statistics was used to test the null hypotheses at 0.05 level of significance.

The findings of the study revealed that eight items out of twelve of human and material resources for teaching welding and fabrication were available in Ekiti State. The studies also revealed that four items were grossly inadequate for students to use. Based on the findings, administration in the secondary school should make available sufficient welding and fabrication resources to enable students acquired necessary skills. Refresher courses seminars workshop and conferences for welding and fabrication teachers with modern facilities will enable then update their knowledge and help to utilized available material resources for the improvement of their teaching. The State Government should ensure that there are adequate finding, recruitment of metalwork personnel and provision of materials resources to enable teachers demonstrate the basic concept of teaching metalwork in secondary schools in Ekiti State.

The study reviewed is related to the present research study because it evaluated the human and material resources for teaching welding and fabrication in S.S.S. in Ekiti State while the present also asses the workshop resources for effective teaching and learning welding and fabrication in technical college in FCT Abuja and Niger State. However, the use of a descriptive survey research is common to both studies. Both used structured questionnaire for data collection, both used Cronbach Alpha for reliability co-efficient; mean, standard deviation and were used for data analysis. The difference between the study reviewed research and the present study is that the reviewed research only used questionnaire while the present used questionnaires and checklist for data collection. The reviewed research was conducted in Ekiti State while the current research was conducted in FCT, Abuja and Niger State and also t-test was used to test the null hypotheses in the reviewed study while checklist was used for the present study.

Adeyanju *et al*., (2011) conducted research on Status of Human and Material Resources in Public Primary Schools in Ogun State. Three research objectives and research hypotheses were used to guide the study. Descriptive design was adopted with forty (40) teachers randomly selected. Questionnaire was the major instrument used while chi – square statistical test was used for analyzing the data. However, it was found that that; adequate training of manpower in the uses of material resources has a significant role in the effectiveness of output, and let there should be adequate continuous supply of material resource which may has significant role in primary education. The findings of the study revealed that there is need for human and materials resources in public primary school. It was recommended among others that government must employ more hands to boost the human resource of public primary schools: device means where human and material resources will be in the continuous supply for primary schools.

The work of the study reviewed and the present study have some similarities, both work places emphasis on human and material resources of teaching skills. Both studies used a descriptive survey research design and structured questionnaires were used for data collection, both used Cronbach Alpha to determine the reliability. However, there are some areas of differences between the two research works such as, the reviewed research used three research objectives and two hypotheses while the present research used five objectives and five research questions. The reviewed research used chi-square for analysis while the present used mean and standard deviation. The reviewed work is in primary school while the present research uses the technical college's teachers and administrators as respondents.

Osarenren and Irabor (2012) carried out research on availability and adequacy of human and material resources for the teaching and learning of skill-based courses in Nigeria Public Universities. In doing this, three research questions and two hypotheses were formulated. A descriptive survey research was used. The population of this study consisted of academic staff and final year students of 2009/2010 academic session in Nigerian Public Universities. The instruments used to collect data were the questionnaire and checklist. The researcher personally visited the ten (10) institutions that were earlier selected through stratified random sampling, and administered questionnaires to the respondents who numbered 1750 but only 1500 were returned. Data was analyzed using the mean statistics, percentage and t-test, the finding amongst other findings was that: the human and material resources on ground for the teaching and learning of skill-based courses in Nigerian Public Universities did not match the minimum standard requirement recommended by the National Universities Commission. Based on these findings, recommendations such as government, non-government organization and good citizens should ensure to provide the needed human and material resources to help in the

production of skilled graduates for national development were made amongst others, hopefully when adhered to, would yield positive results.

The work of the study reviewed and the present work have some similarities, both work places emphasis on human and material resources of teaching skills. Both studies used a descriptive survey research design and checklist and structured questionnaires were used for data collection, both used Cronbach Alpha to determine the reliability, mean standard deviation was used by both researchers to answer the research question and checklist. However, there are some areas of differences between the two research works such as, the reviewed research used three research objectives, three research question and three hypotheses while the present research used five research objectives and five research questions. The reviewed research used university lecturers and final year's students as respondents while the present research uses the technical college's teachers and administrators as respondents.

Akpokier (2014) carried out research on the status of human and material resources for teaching science in secondary schools: issues in education. The study used two research question and three objectives. This study is a descriptive survey on the examination of human and material resources for teaching science in Kontagora metropolis, Niger state. The sample for this study comprised fifty three (53) government and private secondary school teachers purposively selected from 18 Secondary Schools. Out of the 53 teachers, 18 were Biology teachers, 17 chemistry teachers and 18 physics teachers. The instrument used to collect data was a Ten (10) item questionnaire designated Status of Human Resources Questionnaire-(SHRQ) and a checklist on the status of material resources for teaching science. Frequencies and percentages were used to analyze data collected. The findings revealed availability of more materials and teaching staff in government schools,

a higher teacher students' ratio in private schools and insufficient basic materials and equipment in most schools. Based on these findings, employment of more teaching and non-teaching staff, procurement of more materials and equipment among others were recommended.

There are close links between the reviewed research work and the present research work. Both researchers conducted their work on human and material resources for teaching and learning in technical colleges. Researchers adopted descriptive survey research, no sampling was used by both researchers, both adopted Cronbach Alfa for reliabilities coefficient; both used mean and standard deviation and checklist for data analysis. However, there are some area differences between the two research works, the reviewed research used two research question, two research objectives and three hypotheses while the present research used five research objectives, five research questions. The reviewed research was carried out in Kontagora metropolis, Niger state while the current was carried out in Abuja and Niger State. The reviewed research was carried out on science course in secondary school while the present research was on welding and fabrication in technical colleges.

Hanna (2015) conducted research on Assessment of Availability of the Human and Material Resources for the Implementation of the New Basic Education English Language Curriculum in Kaduna North LGEA of Kaduna State. A total number of twenty (20) teachers from ten (10) randomly selected Junior Secondary schools from Kaduna North Local Government Area were used for the study. Data analysis involved the use of frequency count and percentage. The results of the study showed that 65% of the English teachers used for the study are qualified while 35% of the English teachers are not qualified. 65% of the teachers indicated that the number of available English Language

teachers are inadequate while 35% indicated that the English Language teachers available are adequate. The findings also revealed that there is insufficient supply of instructional materials (such as students textbooks, teachers guides, charts, slides, projectors, tapes, audio and video, CDs, DVDs etc) and facilities such as language laboratories, ICT and libraries in all the schools visited. It is recommended that adequate English language teachers should be employed and deployed to schools for quality basic education curriculum delivery. It is also recommended that a comprehensive training/retraining exercise that would enable teachers undergo remedial/capacity building programmes be provided for teachers. Similarly instructional materials should be provided in sufficient quantities in all schools to facilitate the teaching-learning process.

There are close links between the reviewed research work and the present research work. Both researchers conducted their work on availability of human and material resources for teaching and learning. Researchers adopted descriptive survey research, both adopted Cronbach Alfa for reliabilities coefficient. However, there are some area differences between the two research works, the reviewed research used one research question, one research objectives while the present research used five research objectives, five research questions. The reviewed research was carried out in Kaduna State while the current was carried out in Abuja and Niger State. The reviewed research was used random sampling while the present research used no sampling due to manageable size. The reviewed research used Data analysis involved the use of frequency count and percentage while present research used mean and standard deviation.

Serumu (2016) carried out a study on Assessment of Human and Material Resources for the Teaching and Learning of Woodwork in Delta State Technical Colleges. The implementation of woodwork curriculum in technical colleges in Nigeria needs adequate human and material resources for effective teaching and learning of woodwork. However,

several researchers have reported inadequate human and material resources in Nigerian technical colleges. Hence, this study was conducted to assess the human and material resources for the teaching and learning of woodwork in Delta State technical colleges. Ten research questions guided the study and five hypotheses were formulated. Survey research design was used. The population of the study was the six technical colleges and twenty eight staff comprising of principals and woodwork personnel. Census population was used, therefore no sampling was done. The instruments for data collection were National Board for Technical Education (NBTE) checklist of woodwork resources and questionnaire. The questionnaire was face validated by three lecturers from Delta State University, Abraka, and to ascertain the reliability of the questionnaire, it was administered to 10 principals and woodwork personnel from technical colleges in Edo State. Data were analyzed using Cronbach Alpha technique and a reliability coefficient of 0.66 was obtained.

Data were collected by the researcher from woodwork personnel and principals. Also, data collected were analyzed using frequency count, mean, and standard deviation for the research questions, while t-test was used to test the hypotheses at 0.05 level of significance using SPSS version 16.0. The study revealed that the human and material resources for the teaching and learning of woodwork in Delta State technical colleges were inadequate when assessed based on NBTE woodwork resources benchmark and ratings from principals and woodwork personnel. Based on the findings, it was recommended amongst others that adequate human and material resources such as qualified woodwork teachers/instructors, woodwork technicians, workshop attendants, infrastructural facilities, power tools, hand tools, machines and consumable materials ,should be adequately provided in Delta State technical colleges for effective implementation of woodwork curriculum.

There are close links between the reviewed research work and the present research work. Both researchers conducted their work on human and material resources for teaching and learning in technical colleges. Researchers adopted descriptive survey research, no sampling was used by both researchers, both adopted Cronbach Alfa for reliabilities coefficient; both used mean and standard deviation and checklist for data analysis. However, there are some area differences between the two research works, the reviewed research used ten research question, ten research objectives and five hypotheses while the present research used five research objectives and five research questions. The reviewed research was carried out in Delta State while the current was carried out in Abuja and Niger State. The reviewed research was carried out research on woodwork option in technical colleges while the present research was on welding and fabrication technical colleges.

Govand and Nabaz (2021) conducted research on the impact of Human resource management practice on Organizational performance in Kurdistan region of Iraq. In a rapidly changing economic environment, characterized by trends such as, globalization, rising demands of investors and customers, along with increasing products in the market competition, the Government institutions continuously try to progress their performance by minimizing expenses, renewing products and procedures, and improving quality in order to compete and continue in the environment. Eleven hypotheses were used to guide the study. A structured questionnaire was used. A quantitative research method utilized to analyze the current study. A detailed structured questionnaire was prepared and distributed among all the members of this population. The Sample Size selected for this study is 240 respondents. The findings revealed that all hypotheses were rejected except fifth hypothesis which stated that ‘’Decentralization is positively associated with

organizational performance''. Thus, it was concluded that decentralization have a positive association with the organizational performance.

There are close links between the reviewed research work and the present research work. Both researchers conducted their work on human resources for teaching and learning in technical colleges. Researchers adopted descriptive survey research, no sampling was used by both researchers, both adopted Cronbach Alfa for reliabilities coefficient; both used mean and standard deviation and checklist for data analysis. However, there are some area differences between the two research works, the reviewed research used eleven research question, eleven research objectives and eleven hypotheses while the present research used five research objectives, five research questions. The reviewed research was carried out in Kurdistan region of Iraq while the current was carried out in Abuja and Niger State, Nigeria.

2.4 Summary of the Literature Review

The Critical thinking assessment theory reviewed revealed that an individual should be clear about what is to be assessed. Literature reviewed also revealed that the upper three levels of bloom's taxonomy of educational objectives (analysis, synthesis and evaluation) are often offered as a definition of critical thinking. Another theory reviewed was knowledge assessment theory revealed that theory is the knowledge state; which is a complete set of problems that an individual is capable of solving in a particular topic. This reviewed revealed that the result of an assessment consists in two short lists of problems which may be labeled: 'What the student can do' and 'what the student is ready to learn'. The implications of the theory specify the exact knowledge state of individual being assessed. The last theory reviewed in the study is Adaptive Control of Thought (ACT) model. The theory reviewed revealed that a framework for skill acquisition including two major stages in the development of a cognitive skill, i.e., declarative and procedural stage.

Also revealed that the framework "facts are encoded in a propositional network and procedures are encoded as productions".

Attempt has been made to explain welding and fabrication as a skill based programme designed to equip the students with knowledge, attitude and skills to carry out sheet metal work, gas welding, arc welding and cutting jobs on all types of metals and produce simple finished structural steel work projects. An attempt also made to highlight and analyze the various teaching resources for welding and fabrication; the teaching resources are classified into human and non-human material resources. Also problem affecting the availability and utilization of human and material resources in welding and fabrication were explained. Many problem that affecting the utilization and availability ranges from inadequate fund and low level financial commitment, dearth of qualified technical teachers, lack of proper or poor monitoring/evaluation of the metalwork programme, high cost of technical equipment and materials, language barriers, in-accessible to utility (electricity), poor administrative style and procedure. Suggestion for enhancing adequate provision and utilization were reviewed such as training and re-training of technical personnel, good and motivated condition of service, adequate financial provision for school to be made by parents and involve of non-governmental organizations to supply teaching materials to complement government effort. Teachers can also sought for loan in neighboring school or any learning resources center of vocational center. Various teaching methods which could be employed by the Metalwork teacher for effective teaching of welding and fabrication in technical colleges were also reviewed. Some of the teaching resources reviewed include printing materials, textbook, graphics, equipment and machines, improvised material internet library, non-printing material among others.

Several related empirical studies on researches conducted by scholars were reviewed. The studies that were reviewed indicated that resources are needed in teaching and learning in

technical colleges were established, however, these studies failed to provide evidence that relates to workshop resources for teaching and learning welding and fabrication technical colleges which is the gap that the present study intent to fill.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

A descriptive survey research design was used for this study. Questionnaire was used to determine the opinion of the respondents and checklist was used to check the availabilities of the teaching resources. A descriptive survey research is a kind of research in which a group of people or items are studied by collecting and analyzing data from the target group (Nworgu & Nwanuoro 2011). Survey research design was used to elicit responses from welding and fabrication teachers' and administrators on assessment of resources for effective teaching and learning of welding and fabrication practices in FCT Abuja and Niger State technical colleges.

3.2 Area of the Study

The study was conducted in two technical colleges in Niger State and two technical colleges in Federal Territory Abuja FCT, Abuja, Nigeria. Niger State is situated in the North-Central Geopolitical Zone of Nigeria with a total land mass of 86,000km2; approximately 8.6 million hectares constituting about 9.3% of the total land area of the country. Lying on latitude 3.20^0 East and longitude 11.30^0 North, the State shares a country border with the Republic of Benin (West) and State border within Nigeria; these include the Abuja on the South East, Zamfara (West), Kebbi (North West), Kwara (South-West) and Kaduna (North East). While Federal Capital Territory Abuja is also situated in the North Central Nigeria with latitude and longitude coordinates of 9.072264^0N and 7.491302^0E. It is bordered by the states of Niger State to the West and Northwest, Kaduna to the Northeast, Nassarawa to the East and South, and Kogi to the Southwest.

3.3 Population of the Study

The targeted population for the study was 33 respondents comprising of 17 teachers and 16 school administrations (Principal, Vice Principal Administrators, Vice Principal Academic and Head of Department) of technical colleges offering fabrication and welding craft practice in Niger State and FCT, Abuja. Table 3.1 shows the population distribution for the study.

Table 3.1 Distribution of the Population in the Area of the Study

S/N	Name of Technical Colleges	State	Number of Teachers	School Administration	Total
1	Government Technical College,Minna	Niger	03	04	07
2	Federal Science and Technical, Colleges, Kuta, Shiroro	Niger	04	04	08
3	Federal Science and Technical College, Orozo	FCT, Abuja	05	04	09
4	Government Technical Colleges, Garki	FCT, Abuja	05	04	09
	Total		**17**	**16**	**33**

3.4 Sample and Sampling Technique

Since the population is of manageable size, the entire population was study; hence no sampling technique was employed for the study.

3.5 Instrument for Data Collection

A structured questionnaire titled: Fabrication and Welding Craft Practice Resources Assessment Questionnaire (FWCPRAQ) was used to collect data for the study. The questionnaire was divided into two parts, PART 1, was contain personal data of the respondents, and while PART 2 was contains research items to be addressed in the study. The questionnaire items for research questions 1,2,3,4 and 5 were generated from the

NBTE standard for technical college. This part was divided into six Sections (A-E) with 116 items in all. Section A focused on the availability of the machines and equipment for teaching and learning welding and fabrication craft practices in government technical colleges, with 27 items. Section B consisted of 44 items on available hand tools used for teaching and learning of welding and fabrication craft practices in government technical colleges, Section C deals with consumable materials available to teachers and students in welding and fabrication craft practices in government technical colleges, with 24 items. Section D sought information on available man power resources for effective teaching and learning welding and fabrication, consisted of 6 items. Section E deals with teaching resources available for teaching welding and fabrication craft practices in government technical college, consists of 15 items. The items in section B and C contains two points rating scale options of Available (A) and Not Available (NA) assigned numerical value respectively while The items in section D to F were assigned four points rating scale options of Highly Extent (HE), Moderately Extent (ME), Low Extent (LE) and Rarely (R) assigned numerical value of 4, 3, 2 and 1 respectively.

3.6 Validation of the Instrument

The instrument for data collection was validated by two experts in the Department of Industrial and Technology Education, Federal University of Technology Minna Niger State and one expert in Government Technical College, Minna Niger State. The validates ascertained the suitability of the questions, their appropriateness, the scope, the content area, the language clarifications and make correction were needed before the final draft of the questionnaire was produced.

3.7 Reliability of the Instrument

The instrument used for data collection for the study was trial tested using split half method on a sample size of 10 welding and fabrication craft practice and 5 school administrators of government technical college, Ilorin. The choice of Kwara State for the trial testing exercise was informed by the fact that Kwara State did not form part of the study area and also Kwara State is in the same geopolitical zone with Niger State and FCT, Abuja. In conducting the trial test, the researcher used two research assistants were trained on how to administer the questionnaire. The Statistical Package for Social Sciences (SPSS) was used to compute the internal consistency for each of the six research questions. Therefore the internal consistency calculated for each research question as follows; A = 0.81, B = 0.82, C = 0.76, D = 0.83, E = 0.77 and F = 0.68 The Overall reliability coefficient of the instrument was 0.78 indicating that the instrument had a high reliability; the items in the questionnaire were internally consistent in measuring what is intended to be measured for the study.

3.8 Administration of the Instrument

The questionnaire was administered to the respondents by the researcher with the help of three research assistants, the research assistants was employed and briefed on how to assist the researcher in collecting data regarding the study.

3.9 Method of Data Analysis

The data collected for the study was analyzed using frequency count for research question 1 and 2 using checklist contained in the NBTE minimum standard. The mean and standard deviation was used to answer the research questions 3, 4 and 5 while t-test was used to answer the hypotheses at 0.05 level of significant.

The decision on research questions 1 and 2 were based on checklist contained in the NBTE minimum standard that is any machines, equipment and hand tools equals to

NBTE minimum standard was considered available and less than were considered not available. The decision on research questions 3, 4 and 5 were based on the resulting means scores interpreted relative to the concept of real lower and upper limits of numbers shown in Table 3.2. Furthermore, the null hypotheses will be tested using t-test at 0.05 level of significance. The decision on the null hypotheses formulated for the study were based on comparing the significant value with (P<.05), level of significant, that is where the significant value is less than (P< .05) was rejected, while equal or greater than (P<.05) level of significant the hypotheses was upheld or accepted.

Table 3.2: Decision Rules

S/N	Response Mode	Rate	Real limit	Decision
1	Highly Extent	4	3.50-4.00	Highly Extent
2	Moderately Extent	3	2.50-3.49	Moderately Extent
3	Low Extent	2	1.50-2.49	Low Extent
4	Rarely	1	0.50-1.49	Rarely

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Research Question 1

What are the available machines and equipment for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja?

The data for answering research question one is presented in Table 4.1.

Table 4.1: Available Machines and Equipment for Teaching and Learning of Fabrication and Welding Craft Practice based on NBTE Minimum Standard for Technical Colleges

			GTC Minna		FSTC Kuta		FSTC Orozo		GTC Garki		
S/No.	Items	NBTE Minimum Standard	FC	RMK	FC	RMK	FC	RMK	FC	RMK	GRMK
1	Lathe machines	10	0	NA	2	NA	2	NA	1	NA	NA
2	Shaping machines	2	1	NA	1	NA	1	NA	0	NA	NA
3	Drilling machine	1	1	A	1	A	2	A	1	A	A
4	Arc and Gas welding machine	2	1	NA	1	NA	1	NA	0	NA	NA
5	Grinding machines	2	0	NA	1	NA	1	NA	0	NA	NA
6	Filling machines	3	1	NA	2	NA	2	NA	1	NA	NA
7	Sprayers	12	2	NA	4	NA	3	NA	1	NA	NA
8	Power hack saw machine	2	0	NA	1	NA	0	NA	0	NA	NA
9	Electric shear	3	0	NA	1	NA	1	NA	1	NA	NA
10	Oxy-acetylene welding equipment	2	1	NA	1	NA	1	NA	1	NA	NA
11	Spot welding machine	1	0	NA	1	A	0	NA	0	NA	NA
12	Disc cutting machine	2	0	NA	1	NA	1	NA	1	NA	NA
13	Profile cutting machine with gas	2	1	NA	0	NA	1	NA	0	NA	NA
14	Folding machine	1	0	NA	0	NA	0	NA	0	NA	NA
15	Circular cutting machine	2	1	NA	1	NA	0	NA	1	NA	NA
16	Universal beading and swaging machine	2	0	NA	1	NA	1	NA	0	NA	NA
17	Hand nibbling machine	2	1	NA	1	NA	1	NA	1	NA	NA
18	Clamps(assorted)	10	3	NA	6	NA	5	NA	3	NA	NA
19	Furnace	1	0	NA	0	NA	1	A	0	NA	NA
20	Vee block(assorted)	5	1	NA	3	NA	2	NA	1	NA	NA
21	Swage block	2	2	A	2	A	3	A	2	A	A
22	AC Transformer	5	0	NA	1	NA	2	NA	0	NA	NA
23	Guillotine Machine	1	0	NA	1	A	0	NA	0	NA	NA
24	Laser Beam Machine	1	0	NA	0	NA	1	A	0	NA	NA
25	Tungsten Inert Gas (TIG) Machine	1	1	A	0	NA	0	NA	0	NA	NA
26	Automated Welding Machine	1	0	NA	0	NA	0	NA	0	NA	NA
27	Metal Inert Gas (MIG) Machine	1	0	NA	0	NA	1	A	0	NA	NA

Key: FC= Frequency Count, A= Available, NA= Not Available, RMK= Remark, GRMK= General Remark

The result in Table 4.1 indicates that majority of the machines and equipment for teaching and learning fabrication and welding craft practice were not available based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja

4.2 Research Question 2

What are the available hand tools used for teaching and learning of fabrication and welding craft practice based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja?

The data for answering research question two were presented in Table 4.2

Table 4.2: Available Hand Tools used for Teaching and Learning of Fabrication and Welding Craft Practice based on NBTE Minimum Standard for Technical Colleges

S/N	Items	NBTE Minimum Standard	GTC Minna		FSTC Kuta		FSTC Orozo		GTC Garki		
			FC	RMK	FC	RMK	FC	RMK	FC	RMK	GRMK
1	Hammer	30	30	A	31	A	30	A	30	A	A
2	Chisel	20	10	NA	20	A	22	A	30	A	A
3	File	20	8	NA	18	NA	13	NA	9	NA	NA
4	Hacksaw	30	7	NA	12	NA	10	NA	12	NA	NA
5	Tongs	7	5	NA	4	NA	3	NA	2	NA	NA
6	Micrometer	10	3	NA	5	NA	6	NA	3	NA	NA
7	Venier caliper	10	2	NA	8	NA	8	NA	7	NA	NA
8	Steel rule	30	22	NA	30	A	30	A	30	A	A
9	Dot punch	10	6	NA	3	NA	7	NA	5	NA	NA
10	Odd-leg caliper	5	0	NA	1	NA	2	NA	1	NA	NA
11	Try square	30	25	NA	30	A	30	A	30	A	A
12	Combination set	4	2	NA	2	NA	1	NA	0	NA	NA
13	Inside and outside caliper	5	3	NA	1	NA	2	NA	1	NA	NA
14	Venier protractor	15	4	NA	7	NA	4	NA	3	NA	NA
15	Bevel gauge	3	1	NA	0	NA	0	NA	0	NA	NA
16	Electric shear	3	2	NA	1	NA	0	NA	1	NA	NA
17	Pliers	5	5	A	5	A	5	A	5	A	A

18	Rivet gun	2	0	NA	1	NA	1	NA	1	NA	NA
19	Template	10	3	NA	5	NA	6	NA	7	NA	NA
20	Safety goggle	5	2	NA	4	NA	3	NA	4	NA	NA
21	Apron	20	9	NA	12	NA	10	NA	8	NA	NA
22	Safety boot	10	0	NA	2	NA	5	NA	3	NA	NA
23	Soldering bit	20	6	NA	7	NA	6	NA	2	NA	NA
24	Centre punch	30	30	A	30	A	30	A	31	A	A
25	Scriber	30	12	NA	26	NA	12	NA	17	NA	NA
26	Spring divider	30	10	NA	13	NA	18	NA	10	NA	NA
27	Shear snips	10	3	NA	10	NA	5	NA	8	NA	NA
28	Mole grips	6	2	NA	2	NA	6	NA	1	NA	NA
29	Divider	30	13	NA	20	NA	18	NA	15	NA	NA
30	Mallets	20	20	A	21	A	27	A	20	A	A
31	Hand shears/table shears	10	3	NA	4	NA	6	NA	0	NA	NA
32	Rivet sets/riveter	5	2	NA	0	NA	1	NA	1	NA	NA
34	Engineer hand vice	10	5	NA	4	NA	5	NA	1	NA	NA
35	Soldering stoves	10	3	NA	2	NA	5	NA	3	NA	NA
36	Drill bits	20	20	A	23	A	22	A	20	A	A
37	Reamer	20	16	NA	19	NA	18	NA	6	NA	NA
38	Grooving punch	3	0	NA	1	NA	0	NA	1	NA	NA
39	Bending role	2	1	NA	0	NA	0	NA	0	NA	NA
40	Straight snips	5	1	NA	1	NA	1	NA	1	NA	NA
41	Anvil	1	0	NA	0	NA	0	NA	0	NA	NA
42	Respirator	10	0	NA	2	NA	5	NA	0	NA	NA
43	Rivet gun	2	1	NA	1	NA	1	NA	0	NA	NA
44	Hand nibbling machine	2	0	NA	1	NA	1	NA	0	NA	NA

Key: FC= Frequency Count, A= Available, NA= Not Available, RMK= Remark, GRMK= General Remark

Table 4.2 revealed that Hammer, Chisel, Try square, Pliers, Centre punch, Mallets and Drill bits were available based on NBTE minimum standard whereas the other 37 hand tools were not available even though some of the technical colleges have certain number available but not up to NBTE minimum required standard. The result in Table 4.2 indicates that majority of the hand tools for teaching and learning fabrication and welding craft practice were not available based on NBTE minimum standard for technical colleges in Niger State and FCT, Abuja

4.3 Research Question 3

To what extent are consumable materials available for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?

The data for answering research question two were presented in Table 4.3

Table 4.3: Means Responses and Standard Deviation of Respondents as Regards the Extent of Consumable Materials Available for Teaching and Learning of Fabrication and Welding Craft Practice.

N=33

S/N	**Items**	$\bar{X}_T$	SD_T	**Remark**
1	Angle grinding wheels	2.91	0.29	Moderately Extent
2	Filler rods	2.86	0.35	Moderately Extent
3	Parent plates or pipes (materials)	2.95	0.21	Moderately Extent
4	Solid wires	3.07	0.50	Moderately Extent
5	Welding wires	2.98	0.55	Moderately Extent
6	Electrodes	3.45	0.50	Moderately Extent
7	Fluxes	3.32	0.47	Moderately Extent
8	Saw wires	3.57	0.50	Highly Extent
9	Flux cored wires	3.39	0.49	Moderately Extent
10	Paints	2.41	0.49	Low Extent
11	Filler wires	2.00	0.00	Low Extent
12	Shielding gas	2.61	0.54	Moderately Extent
13	Gases (Hydrogen, Ammonia, Carbondioxide)	2.89	0.32	Moderately Extent
14	Mild steel hollow bars	2.89	0.32	Moderately Extent
15	Square steel hollow bars	2.86	0.35	Moderately Extent
16	Rectangular steel hollow bars	2.65	0.48	Moderately Extent
17	Angular steel hollow bars	3.00	0.00	Moderately Extent
18	Steel pipe	3.14	0.35	Moderately Extent
19	Circular hollow bars	3.14	0.35	Moderately Extent
20	Alloy Steel	2.75	0.44	Moderately Extent
21	Stainless steel	3.20	0.55	Moderately Extent
22	Carbon steel	2.84	0.53	Moderately Extent
23	Galvanized steel	3.45	0.50	Moderately Extent
24	Tool Steel	2.90	0.29	Moderately Extent
	Grand Mean/SD	**2.97**	**0.39**	Moderately Extent

Key: N= Numbers of Respondents, X_T = Mean of All Respondents, SD_T = Average Standard Deviation.

Table 4.3 shows the mean responses of the respondents on the 24 items posed to determine the extent to which consumable materials are available for the teaching and learning of fabrication and welding craft practice with a grand mean of 2.97 which implies that the respondents jointly agreed with the majority of items as consumable materials moderately available for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT Abuja. The standard deviation of items ranges from 0.00 to 0.55 which showed that the respondents were not too far from the mean and were closed in one another in their responses. This closeness of the responses adds values to the reliability of the items.

4.4 Research Question 4

To what extent are man power resources (academic and non-academic) available for effective teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?

The data for answering research question four were presented in Table 4.4

Table 4.4: Means Responses and Standard Deviation of Respondents as Regards the Extent of Man Power Resources Available for Effective Teaching and Learning of Fabrication and Welding Craft Practice in Technical Colleges **N=33**

S/N	**Items**	$\bar{X}_T$	SD_T	**Remark**
1	Teachers are available for teaching fabrication and welding craft practice	3.59	0.49	Highly Extent
2	Administrators are available to oversee the teaching of fabrication and welding craft practice	3.97	0.15	Highly Extent
3	Workshop Attendants are available for teaching of fabrication and welding craft practice	3.97	0.15	Highly Extent
4	There are health personnel in technical colleges in case of accident during practical classes of fabrication and welding craft practice	1.39	0.75	Low Extent
5	Library staff are available for improve learning of fabrication and welding craft practice	2.00	0.50	Low Extent
6	Cleaners are available to motivate the teaching and learning of fabrication and welding craft practice	1.34	0.45	Low Extent
	Grand Mean/SD	**2.71**	**0.41**	Moderate Extent

Key: N= Numbers of Respondents, X_T = Mean of All Respondents, SD_T = Average Standard Deviation.

Table 4.4 shows the mean responses of the respondents on the 6 items posed to determine the extent to which man power resources are available for effective teaching and learning of welding and fabrication practice. 3 out 6 items were moderately available and the other 3 were rated with lower limit extent regarding available man power with a grand mean of 2.71 which implies that respondents' entire response was within moderate extent in the whole items as man power resources available for effective teaching and learning of fabrication and welding craft practice. The standard deviation of items ranges from 0.15 to 0.75 showed that the respondents were not too far from the mean and were closed in one another in their responses. This closeness of the responses adds values to the reliability of the item.

4.5 Research Question 5

To what extent are teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja?

The data for answering research question five were presented in Table 4.5

Table 4.5: Means Responses and Standard Deviation of Respondents as Regards the Extent Teaching and Learning Resources Available for use by the Teachers in Fabrication and Welding Craft Practice in Technical Colleges **N=33**

S/N	**Items**	$\bar{X}_T$	SD_T	**Remark**
1	Projectors	1.57	0.50	Low Extent
2	Instructional laboratories (Auto Card)	1.39	0.49	Low Extent
3	Magic board	1.41	0.49	Low Extent
4	Screens	2.00	0.00	Low Extent
5	Computer	1.59	0.49	Low Extent
6	Standard drawing studios	2.89	0.32	Moderately Extent
7	Internet service	1.89	0.32	Low Extent
8	White/chalk board	1.86	0.35	Low Extent
9	Flips board	1.66	0.48	Low Extent
10	Visual realities goggles	1.66	0.48	Low Extent
11	Manuals	3.00	0.00	Highly Extent
12	Textbook	2.14	0.35	Low Extent
13	Study guide	3.14	0.35	Moderately Extent
14	Slides	2.75	0.44	Moderately Extent
15	Graphic calculations	2.20	0.55	Low Extent
	Grand Mean/SD	**2.07**	**0.37**	Low Extent

Key: N= Numbers of Respondents, X_T = Mean of All Respondents, SD_T = Average Standard Deviation.

Table 4.5 shows the mean responses of the respondents on the 15 items posed to determine the extent teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges with a grand mean of 2.07 which implies that respondents jointly agree that teaching and learning resources were available to a low extent for teaching welding and fabrication practice. The standard deviation of items ranges from 0.00 to 0.55 showed that the respondents were not too far from the mean and were closed in one another in their responses. This closeness of the responses adds values to the reliability of the item.

4.6 Hypothesis One

There will be no significant difference in mean response of school administrators and fabrication and welding teachers on the extent of consumable materials available for the teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

The data for testing hypothesis one were presented in Table 4.6

Table 4.6: T-Test Analysis of Significant Difference in the Mean Responses of the Respondents as Regards the Extent of Consumable Materials Available for the Teaching and Learning of Fabrication and Welding Craft Practice in Technical Colleges in Niger State and FCT, Abuja.

Technical schools	N	Mean	SD	df	T	P-value	Remark
School Administrators	27	2.96	0.98				
				42	-1.25	0.22	Accepted
Teachers	17	2.99	0.07				

Table 4.6 shows the t-test analysis of differences in the responses of school administrators and teachers in Technical Colleges in Niger State and FCT, Abuja as regards the extent are consumable materials available for the teaching and learning of fabrication and

welding craft practice in technical colleges in Niger State and FCT, Abuja. The table revealed that the probability value obtained was found to be 0.22 which is greater than the probability value of 0.05 in comparison. The null hypothesis was therefore accepted. Therefore, there was no significant difference in mean response of school administrators and welding and fabrication teachers on the extent consumable materials available for the teachers and students in welding and fabrication practice in Technical Colleges in Niger State and FCT, Abuja

`4.7 Hypothesis Two

There will be no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of man power resources (academic and non-academic) available for effective teaching and learning of fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

The data for testing hypothesis two were presented in Table 4.7

Table 4.7: T-Test Analysis of Significant Difference in the Mean Responses of the Respondents as Regards the Extent of Man Power Resources Available for Effective Teaching and Learning of Fabrication and Welding Craft Practice in Technical Colleges in Niger State and FCT, Abuja

Technical school`s	9	Mean	SD	df	T	P-value	Remarks
School Administrators	27	3.52	0.26				
				42	-7.17	0.05	Rejected
Teachers	17	3.93	0.12				

Table 4.7 shows the t-test analysis of differences in the responses of school administrators and teachers in Technical Colleges in Niger State and FCT, Abuja as regards the extent of man power resources available for effective teaching and learning of fabrication and welding practice. The table revealed that the probability value obtained was found to be 0.05 which is less than the probability value of 0.05 in comparison. The null hypothesis was therefore rejected. Therefore, there was significant difference in mean response of

school administrators and fabrication and welding teachers on the extent man power resources available for effective teaching and learning of fabrication and welding practice in Technical Colleges in Niger State and FCT, Abuja.

4.8 Hypothesis Three

There will be no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja

The data for testing hypothesis three were presented in Table 4.8

Table 4.8: T-Test Analysis of Significant Difference in the Mean Responses of the Respondents as Regards the Extent of Teaching and Learning Resources Available for use by the Teachers in Fabrication and Welding Craft Practice in Technical Colleges in Niger State and FCT, Abuja

Technical schools	N	Mean	SD	Df	T	P-value
School Administrators	27	2.85	0.15			
				42	-2.14	0.05
Teachers	17	2.92	0.05			

Table 4.8 shows the t-test analysis of differences in the responses of school administrators and teachers in Technical Colleges in Niger State and FCT, Abuja as regards the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges in Niger State and FCT, Abuja. The table revealed that the probability value obtained was found to be 0.04 which is less than the probability value of 0.05 in comparison. The null hypothesis was therefore rejected. Therefore, there was significant difference in mean response of school administrators and welding and fabrication teachers on the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical

colleges in Niger State and FCT, Abuja instructional teaching aids available for fabrication and welding practice in Technical Colleges in Niger State and FCT, Abuja.

4.9 Findings of the Study

The findings of the study based on the data collected and analyzed with reference to the research questions and hypotheses that guided the study are as follows:

1. The findings on the available machines and equipment for teaching and learning of fabrication and welding craft practice in Technical Colleges revealed that drilling machine and swage block were available whereas the other 25 machines and equipment were not available based on NBTE minimum standard
2. The findings on the available hand tools for teaching and learning of fabrication and welding craft practice in Technical Colleges revealed that Hammer, Chisel, Try square, Pliers, Centre punch, Mallets and Drill bits were available and other 37 were not available based on NBTE minimum standard
3. The findings on the extent of consumable materials available for the teaching and learning of fabrication and welding craft practice revealed that majority of items as consumable materials were moderately available in technical colleges
4. The finding on the extent of man power resources available for effective teaching and learning of welding and fabrication craft practice revealed that 3 out 6 items were moderately available in Technical Colleges
5. The findings on the extent of teaching and learning resources available for use by the teachers in fabrication and welding craft practice in technical colleges were available to a low extent.
6. There was no significant difference in mean response of school administrators and welding and fabrication teachers on the extent of the consumable materials

available for the teaching and learning of fabrication and welding craft practice in Technical Colleges in Niger State and FCT, Abuja

7. There was significant difference in mean response of school administrators and welding and fabrication teachers on the extent of man power resources available for effective teaching and learning of fabrication and welding craft practice in Technical Colleges in Niger State and FCT, Abuja.
8. There was significant difference in mean response of school administrators and welding and fabrication teachers on the extent teaching and learning resources available for use by the teachers in fabrication and welding craft practice in Technical Colleges in Niger State and FCT, Abuja.

4.10 Discussion of Findings

The findings in the Table 4.1 relating to research question 1 on the available machines and equipment for teaching and learning of fabrication and welding craft practice in Technical Colleges revealed that drilling machine and swage block were available whereas the other 25 machines and equipment were not available based on NBTE minimum standard. In support of this finding Okwori (2012) noted that physical facilities such as workshops, machines and tools are not enough. These inadequacies affect students' performance in both theory and practical work. This means that the objectives of technical education will be difficult to achieve. He also disclosed that lack of equipment in schools will make our students not to have ample opportunities to see and manipulate them in order to acquire the necessary knowledge and skills. In agreement with the finding is Umunadi (2011) who is of the view that facilities which include the buildings, equipment, tools and school materials available are inadequate for effective use in schools is one of the major problems in technical colleges in Nigeria.

In a similar view Putsoa (2005), stated that the foremost factors affecting the effective implementation of technical education objectives were also inadequate instructional equipment and the lack of up-to-date school plants. Also, Yusuf (2006) reported that facilities in vocational and technical schools were scarcely available, grossly inadequate and most of them in poor condition. In the same with the finding Ekpenyong (2011) posited that, there are a number of factors, which have in various proportions impeded the smooth implementation of the goals and objectives of technical education. Some of the outstanding factors affecting the implementation of technical education include inadequate supply of technical teachers and equipment.

The findings in the Table 4.2 relating to research question 2 on the available hand tools for teaching and learning of fabrication and welding craft practice in Technical Colleges revealed that Hammer, Chisel, Try square, Pliers, Centre punch, Mallets and Drill bits were available and other 37 were not available based on NBTE minimum standard. This finding is in agreement with Okebukola (2012) who reported in his study inadequacies in instructional materials/ material resources such as hand tools. Also in agreement with finding Puyate (2006), reported that most of the equipment's, tools, and workshop facilities are either broken down or damaged or dilapidated. Towe (2007) also reported that there was no evidence of practical work in a course which was supposed to introduce students to various skill-based programmes even where workshop and laboratories were available they were deprived of functional essential tools, equipment and materials. Also in-line with the finding Offorma (2005) noted that vocational and technical subjects are not effectively implemented as most of the subjects are not offered due to lack of teachers, workshops for practical work, and further noted that where there are teachers the delivery is usually theorized because of lack of competence on the part of the teacher or due to lack of equipment, thus students graduate without any hands-on experience.

The Findings in Table 4.2 relating to research question 3 revealed that on the extent of consumable materials available for the teaching and learning of fabrication and welding craft practice revealed that majority of items as consumable materials were moderately available to some extent in technical colleges. This is in-line with Egbu *et al.,* (2015) viewed that consumable resources consist of the major tools the teacher employs in transmitting knowledge. They are all the physical resources a teacher uses to help him/her explain or elucidate the topic/content to the learners so that they will be able to comprehend the topic. Ukadike (2013) stated that effective teaching and learning cannot take place without adequate and appropriate consumable material resources. Abijo and Oyekanmi (2017), asserted that school, consumable material resources when provided will aid teaching learning programme and consequently improve academic achievement of students while the models guide their provision to schools could take any form as rational bureaucratic and political model whichever model is adopted according to him, there is always a common feature of differing allocation of facilities to schools.

The Findings in Table 4.4 relating to research question 4 on the extent of man power resources available for effective teaching and learning of welding and fabrication craft practice revealed that were moderately available to some extent in Technical Colleges. This finding is in consonant with Gbosi (2003) postulated the manpower are human beings with the relevant skills, energies, talents, knowledge and attitudes that can be committed towards the production of goods and services. Dharamvirsinh and Prashant (2012) identified the following benefits that organizations stand to gain by engaging in manpower planning: shortage and surpluses can be identified so that quick action can be taken wherever required; all the requirement and selection programmes are based on manpower planning; it also helps to reduce the labour cost as excess staff can be identified and thereby overstaffing can be avoided; it recognizes the available talents in

concern and training programmes can be done to enhance those talents; and with the help of manpower planning, organization can optimally utilize the available human resources to increase the growth and diversification of business. Igbinomwanhia (2010) viewed that skilled manpower is one of the most crucial inputs of modern economic growth and to avoid critical shortages or surpluses of manpower. Planners or decision makers have sought to identify future requirements for skilled manpower and to design the education system so as to produce a labour force with the necessary skill and technical or professional knowledge.

The Findings in Table 4.5 relating to research question 5 revealed that Projectors, internet service, computer, white/black board, Standard drawing studios mention but a few were instructional teaching aids available for welding and fabrication practice. The finding is in conformity with the observation of Ojo (2010) that other instructional materials that provide information to pupils which afford students the opportunity to see, touch and do are: Audio-visual aids e.g., Projectors, Tape recorder, multi-dimensional projector, Computer and other electronics devices. The teaching-learning resources that are primarily used in educational institutions are, textbooks, articles, reports, documents, projects, hand-outs, other reading materials, guides, reference books, models, excursions, field-visits, charts, structures, designs, calculators, computers, projectors, mobile phones, machines, hand tools and internet. These are the important resources that are used by teachers as well as students to achieve desired academic outcomes. When the students have access to these resources, then they can carry out their tasks and activities independently. They are able to complete their class as well as homework assignments and, in this manner, an enriched learning environment can be created (Mugure, 2012). Teaching learning resources are all the things used by the teacher during teaching to aid understanding and make teaching successful and effective. They include modern

textbooks, equipment, consumables like chemicals and reagents, models, charts etc. and the physical learning environments which include the science classrooms and laboratories (Omorogbe & Ewansiha**,** 2013). These findings are in disagreement with Ekpeyong (2011); Miller (2011) and Odu (2011) who reported inadequate material resources which include and not limited to powertools. In line with Okwori (2012); and Akinfolarin *et al*., (2012), reported that material resources such as power tools were adequate in technical institutions.

The finding in Table 4.6 relating to hypothesis 1 showed that there was no significant difference in mean response of school administrators and welding and fabrication teachers on the consumable materials available for the teachers and students in welding and fabrication practice in technical colleges in Niger State and FCT, Abuja. This means that the school administrators and welding and fabrication teachers had different perception on the consumable materials available for the teachers and students in welding and fabrication practice in technical colleges. The findings is in agreement with Abijo and Oyekanmi (2017), asserted that school, consumable material resources when provided will aid teaching learning programme and consequently improve academic achievement of students while the models guides their provision to schools could take any form as rational bureaucratic and political model whichever model is adopted according to him, there is always a common feature of differing allocation of facilities to schools.

The finding in Table 4.7 relating to hypothesis 2 showed that there was no significant difference in mean response of school administrators and welding and fabrication teachers on the man power resources available for effective teaching and learning of welding and fabrication practice in technical colleges. This means that the school administrators and welding and fabrication teachers had similar perception on the man power resources available for effective teaching and learning of welding and fabrication

practice in technical colleges. The finding is in conformity with the observation of Ojo (2010) that other instructional materials that provide information to pupils which afford students the opportunity to see, touch and do are: Audio-visual aids e.g. Projectors, Tape recorder, Multi-dimensional projector, Computer and other electronics devices.

The finding in Table 4.8 relating to hypothesis 3 showed that there was significant difference in mean response of school administrators and welding and fabrication teachers on the instructional teaching aids available for fabrication and welding craft practice in technical colleges. This means that the school administrators and welding and fabrication teachers had similar perception on the instructional teaching aids available for fabrication and welding practice in technical colleges. The teaching-learning resources that are primarily used in educational institutions are, textbooks, articles, reports, documents, projects, hand-outs, other reading materials, guides, reference books, models, excursions, field-visits, charts, structures, designs, calculators, computers, projectors, mobile phones, machines, hand tools and internet. These are the important resources that are used by teachers as well as students to achieve desired academic outcomes. When the students have access to these resources, then they can carry out their tasks and activities independently. They are able to complete their class as well as homework assignments and, in this manner, an enriched learning environment can be created (Mugure, 2012).

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study assessed the workshop resources for effective teaching and learning of fabrication and welding craft practices in government technical college in Nigeria. The findings of the study serve as the basis for making the following conclusion that machine, equipment and hand tools are not available in technical colleges. It was also concluded that consumable materials available for the teaching and learning of fabrication and welding practice such as, angle grinding wheels filler rods, solid wires, welding wires, parent plates or pipes (materials), electrodes were moderately available to some extent in technical colleges. It was also concluded that man power resources available for effective teaching and learning of welding and fabrication practice such as administrators and teachers available for teaching, workshop assistants were also available to assist the students but a few man power resources were not available for effective teaching of fabrication and welding craft practice in technical colleges.

It was further concluded that all the projectors, internet service, computer, white/black board, Standard drawing studios mention but a few were instructional teaching aids not available for fabrication and welding craft practice Therefore, this study has implication for government, private companies and citizens to provides adequate workshop resources (human and material resources) needed for teaching fabrication and welding in technical colleges which will make the graduate of technical colleges to become competent craftsmen and function in the world of works.

5.2 Recommendations

Based on the findings of this research work, the following recommendations were made

1. Government should provide adequate equipment for fabrication and welding craft practice in technical college to enable teaching and learning effective.
2. Metalwork hand tools such as hacksaw, hammer, scriber and others should be adequately provided in Niger State and Abuja technical colleges for effective implementation of metalwork curriculum.
3. Metalwork consumable materials such as filler wire and paints should be adequately provided in Niger State and Abuja technical colleges for effective implementation of metalwork curriculum.
4. Metalwork power tools such as electric shear, disc cutting machine, circular cutting machine, and others should be adequately provided in Niger State and Abuja technical colleges for effective implementation of metalwork curriculum.
5. The state government should ensure that there are adequate recruitment of personnel and provision of workshop resources to facilitate the teaching of fabrication and welding craft practice and teachers demonstrate the basic concept in technical colleges.
6. Government, non-government organization and good citizens should ensure provision of the needed workshop resources to help in the production of skilled graduate.

5.3 Suggestions for Further Studies

1. Assessment of workshop resources for the teaching and learning process of fabrication and welding practice in Government Technical Colleges in other part of Nigeria.

2. Level of awareness and compliances of workshop resources of fabrication and welding crafts practices for teaching and learning process in Government technical colleges in Nigeria.
3. Impacts of workshop resources management practices in Government technical colleges in Nigeria.
4. Assessment of workshop resources for the teaching and learning process of woodwork craft practice in Government Technical Colleges in Southern**,** Nigeria.
5. Assessment of workshop resources for the teaching and learning of Auto-Vehicle Mechanic in Government Technical Colleges in North central of Nigeria.
6. Assessment of workshop resources for the teaching and learning of Brick/Block-laying and Concreting in Government Technical Colleges in Niger State and Abuja of Nigeria.

5.4 Contribution to Knowledge

The study contribute to the body of knowledge by revealing the machines, equipment and hand tools that are not available for teaching and learning of fabrication and welding craft practice, the extent to which consumable materials are available for the teaching and learning of fabrication and welding craft practice with grand mean of 2.97 and the extent to which man power resources are available for effective teaching and learning of welding and fabrication craft practice with grand mean of 2.71 in Technical Colleges

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APPENDIX A

RESEARCH INSTRUMENT
FABRICATION AND WELDING CRAFT PRACTICE RESOURCES ASSESSMENT QUESTIONNAIRE

RESEARCH TOPIC: ASSESSMENT OF WORKSHOP RESOURCES FOR EFFECTIVE TEACHING AND LEARNING OF FABRICATION AND WELDING CRAFT PRACTICE IN NIGER STATE AND FCT ABUJA TECHNICAL COLLEGES, NIGERIA.

PART 1:

Instruction: Please tick (√) Available (AV) and Not Available (NA) according to the resources available in your schools in Research Question one and two.

Research Question Three, Four and Five Please tick (√)

Highly Extent HE (1), Moderately Extent ME (2), Low Extent LE (3), Rarely R (4),

1. Categories of Respondents:
    a) Administrators [ ]
    b) Teachers [ ]

Indicate your level of Agreement on the Assessment of workshop Resources for Effective Teaching and Learning of Welding and Fabrication Craft in Niger State Technical Colleges. Qualification: PhD (VTE) [ ], M.TECH (I.T.E) [ ], M.ED [ ], B.ED (Tech) [ ], HND [ ], NCE (Tech) [ ], ND [ ], TC11 [ ]

2. Length of Teaching Experiences: 1-5 [ ], 6-10 [ ], 11-15 [ ], 16-20 [ ], Others [ ].

PART II

SECTION A

RESEARCH QUESTION 1: Are the Machines and Equipment Available for Teaching and learning of Fabrication and Welding Craft Practice in Government Technical Colleges in Niger State FCT Abuja?

S/N	ITEM STATEMENT	MINIMUM QUANTITY REQUIRED	QUANTITY AVAILABLE	RESPONSES	
				AV	NA
1	Lathe machines	10			
2	Shaping machines	02			
3	Drilling machine	01			
4	Arc and Gas welding machine	02			
5	Grinding machines	02			
6	Filling machines	03			
7	Sprayers	12			
8	Power hack saw machine	02			
9	Electric shear	03			
10	Oxy-acetylene welding equipment	02			
11	Spot welding machine	01			
12	Disc cutting machine	02			
13	Profile cutting machine with gas	02			
14	Folding machine	01			
15	Circular cutting machine	02			
16	Universal beading and swaging machine	02			
17	Hand nibbling machine	02			

18	Clamps(assorted)	10			
19	Furnace	01			
20	Vee block(assorted)	05			
21	Swage block	02			
22	AC Transformer	05			
23	Guillotine Machine	01			
24	Laser Beam Machine	01			
25	Tungsten Inert Gas (TIG) Machine	01			
26	Automated Welding Machine	01			
27	Metal Inert Gas (MIG) Machine	01			

SECTION B

RESEARCH QUESTION 2: Are the Hand Tools used for Teaching and Learning of fabrication and Welding Craft Practice Adequate to Government Technical Colleges in Niger State and FCT?

	HAND TOOLS			**RESPONSE**	
S/N	**ITEM STATEMENT**	**MINIMUM QUANTITIES REQUIRED**	**QUANTITIES AVAILABLE**	**AV**	**NA**
1	Hammer	30			
2	Chisel	20			
3	File	20			
4	Hacksaw	30			
5	Tongs	07			
6	Micrometer	10			
7	Venier caliper	10			
8	Steel rule	30			
9	Dot punch	10			

10	Odd-leg caliper	5			
11	Try square	30			
12	Combination set	04			
13	Inside and outside caliper	5			
14	Venier protractor	15			
15	Bevel guage	03			
16	Electric shear	03			
17	Plier	05			
18	Rivet gun	O2			
19	Template	10			
20	Safety google	05			
21	Apron	20			
22	Safety boot	10			
23	Soldering bit	20			
24	Centre punch	30			
25	Scriber	30			
26	Spring divider	30			
27	Shear snips	10			
28	Mole grips	06			
29	Divider	30			
30	Mallets	20			
31	Hand shears/table shears	10 Each			
32	Rivet sets/riveter	05			
34	Engineer hand vice	10			
35	Soldering stoves	10			
36	Drill bits	20			
37	Reamer	20			
38	Grooving punch	03			
39	Bending role	02			

40	Straight snips	05			
41	Anvil	01			
42	Respirator	10			
43	Rivet gun	02			
44	Hand nibbling machine	02			

SECTION C

Research Question 3: Are the consumable materials available for the teachers and students in fabrication and welding craft practice in Government Technical Colleges in Niger State and FCT Abuja?

	CONSUMABLE MATERIALS	**RESPONSE**			
S/N	**ITEM STATEMENT**	**HE**	**ME**	**LE**	**R**
1	Angle grinding wheels				
2	Filler rods				
3	Parent Plates or Pipes (Materials)				
4	Solid Wires				
5	Welding wires				
6	Electrodes				
7	Fluxes				
8	Saw Wires				
9	Flux cored Wires				
10	Paints				
11	Filler Wires				
12	Shielding Gas				
13	Gases (Hydrogen, Ammonia, Carbondioxide)				
14	Mild steel hollow				
15	Square steel hollow				
16	Rectangular steel hollow				

17	Angular steel hollow				
18	Steel pipe				
19	Circular hollow				
20	Alloy steel				
21	Stainless steel				
22	Carbon steel				
23	Galvanized steel				
24	Tool steel				

SECTION D

RESEARCH QUESTION 4: Are the man power resources available for effective teaching and learning of fabrication and welding craft practice in Government Technical Colleges in Niger State FCT Abuja?

	HUMAN RESOURCES	**RESPONSE**			
S/N	**ITEM STATEMENT**	**HE**	**ME**	**LE**	**R**
1	Teachers available for teaching in class 30				
2	Technicians available to train 30 students of welding and fabrication in workshop				
3	Workshop assistants available to assist the technicians during training of 30 students				
4	Cleaners to clean workshop, classrooms and offices after daily activities.				
5	Administrators for the school affairs				

SECTION E

RESEARCH QUESTION 5: Find out the Instructional Resources adopted by Teachers in Fabrication and Welding Craft Practice in Government Technical Colleges in Niger State and FCT Abuja?

S/N	TEACHING STRATEGY	HE	ME	LE	R
1	Projectors				
2	Instructional Laboratories (Auto Card)				
3	Magic board				
4	Screens				
5	Computers				
6	Standard Drawing Studios				
7	Internet Service				
8	White/Chalk Board				
9	Flips Board				
10	Visual realities goggles				
11	Manuals				
12	Textbooks				
13	Study Guide				
14	Slides				
15	Graphing Calculations				

APPENDIX B

VALIDATION CERTIFICATE

This is to certify that the instrument on the research work titled: **investigation into the assessment of workshop resources for effective teaching and learning of welding and fabrication craft in Niger State technical colleges,** was validated by me:

Name of First Validates': Maikudi Zakari

Institution: Government Technical College, Minna.

Department: Mvm/Metal Works.

Signature and Date: 2025-06-21

Name of Second validates': Dr. IBRAHIM YAKUBU UMOR

Institution: FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

Department: ITE DEPT

Signature and Date: 29/6/2021

Name of Second validates': Mohammed Abdulkareem Bello

Institution: Federal University of Technology, Minna

Department: ITE

Signature 21/7/21

Name of Research Student: Ubanwa Sussan

Matriculation Number: MTech/SSTE/2018/8944

Programme of Study: MTech Industrial and Technology Education (Metalwork Technology)

NIGER STATE SCIENCE AND TECHNICAL SCHOOLS BOARD

S/N	NAME OF TECHNICAL SCHOOLS	NUMBER OF MVM TEACHERS
1	GOVERNMENT TECHNICAL COLLEGE EYAGI BIDA	5
2	GOVERNMENT TECHNICAL COLLEGE KONTAGORA	2
3	SULEIMAN BARAU TECHNICAL COLLEGE SULEJA	3
4	GOVERNMENT TECHNICAL COLLEGE MINNA	6
5	GOVERNMENT TECHNICAL COLLEGE NEW BUSSA	4
6	MAMAN KONTAGORA TECH. COLLEGE PANDOGARI	2

The above data is sourced from Niger State Science and Technical Schools Board, Minna (NSSTSB

Secretary
Niger State Science & Tech. Schs. Board, Minna
Date 08/04/24

.....
IDRIS SABA JIPAN
Secretary

VALIDATION CERTIFICATE

This is to certify that, the research instruments titled: Questionnaire on the Competences Required for Competency Framework for Motor Vehicle Mechanics Work Teachers and Content Validity Index for Competency Framework were validated by:

Name: DR. AUDU RUFAI

Institution: FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

Department: INDUSTRIAL & TECHNOLOGY EDUCATION

Signature and Date: 05/07/2021

Name: Mohammed Abdulkadir PhD

Institution: Federal University of Technology Minna

Department: Head

Signature and Date: 5/7/21

Name: ENGR. DR. ELUSOLA EMMANUEL, O.

Institution: NIGER STATE POLYTECHNIC, ZUNGERU

Department: MECHANICAL ENGINEERING TECHNOLOGY

Signature and Date: 13/07/2021

DEAN, SCHOOL OF
POSTGRADUATE STUDIES
NIGER STATE POLYTECHNIC
ZUNGERU
Date: 13th July 2021.

GOVERNMENT TECHNICAL COLLEGE MINNA, NIGER STATE

1. Number of Teachers teaching Welding and fabrication - 2
2. Number of Instructors/Technicians - 1
3. Number of SS 2 students offering Welding and fabrication - 18

Signed.....
Management

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA.

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

Vice Chancellor:
PROF. ABDULLAHI BALA, FSSN
B. Agric (ABU), M. Sc (Reading), Ph.D (London)

Head of Department:
DR. I. Y. UMAR, MTRCN, MTEPAN.
B. Tech, M.Tech (Minna), Ph.D (SWU-China)
E-mail: umaryakubu@futminna.edu.ng

P.M.B. 65, Minna
Telephone: +2348066059717
E-mail: ite@futminna.edu.ng
Website: www.futminna.edu.ng

Your Ref. _____

Our Ref. _____

Date: 22nd Sept - 2021

The Principal
Government Science Technical College
Area 3, Garki
.....

Sir/Ma,

TO WHOM IT MAY CONCERN

The bearer, USMAN ALI SUSSAN C. with Registration Number M.Tech/ MTECH/SCITECH/18/8744 is A Master student of Industrial and Technology Education Department.

He is carrying out a research titled: ASSESMENT OF WORKSHOP RESOURCES FOR EFFECTIVE TEACHING AND LEARNING OF WELDING AND FABRICATION CRAFT IN NIGER STATE TECHNICAL COLLEGES, NIGERIA AND FCT ABUJA

He needs your assistance to enable him carry out his field work.

We will appreciate your anticipated co-operation.

Thank you.

12/04/2021
Dr. E. Raymond
Postgraduate Coordinator, ITE.

'A'
VP(Admin/Acad)
Please handle, Me.
Principal
22.09.2021

'B'
Pls Mr Sadiq
Take care
24/9/21

Department of Industrial and Technology Education
School of Science and Technology Education
Federal University of Technology Minna
Niger State
24th September, 2021

The Principal
Government Science and Technical College
Area 3, Garki
Abuja
Sir,

SOLICITATION LETTER

I wish to request for the total number of the following under welding and fabrication in your school

1. Number of students — Sixty (60)
2. Number of workshop attendants one (1)
3. Number of teachers — Four (4)
4. Number of school administrators — Three (3)

All the information provided will be treated confidentially and used only for the purpose of this research.

Thank you.

24/9/21

Hajia Hauwa Mohammed
VP ACAD.
Government Science Technical College
Area 3, Garki, Abuja.

UBANWA SUSSAN
M.TECH/SSTE/2018/8944
07039721245

NIGER STATE SCIENCE AND TECHNICAL SCHOOLS BOARD

COURSES OFFERED IN TECHNICAL COLLEGES

S/N	COURSES	GTC MINNA	GTC E/BIDA	GTC KONTAGORA	SBSTC SULEJA	GTC NEW BUSSA	MKTC PANDOGARI
1	BUILDING CONSTRUCTION	√	√	√	√	√	√
2	FURNITURE MAKING	√	√	√	√	√	√
3	ELECTRICAL INSTALLATION	√	√	√	√	√	√
4	MOTOR VEHICLE MECHANICS	√	√	√	√	√	√
5	BUSINESS	√	√	√	√	√	√
6	ELECTRONICS	√	√	X	X	√	X
7	COMPUTER	X	√	X	√	X	X
8	CATERING CRAFT PRACTICE	√	√	X	√	√	X
9	FABRICATION & WELDING	√	X	X	X	X	X
10	GARMENT MAKING	√	X	X	X	X	X
11	FISHERIES	X	X	X	X	√	X
	TOTAL	9	8	5	7	8	5

Secretary
Niger State Science & Tech. Schs. Board, Minna
Date 28/4/2024

FEDERAL SCIENCE AND TECHNICAL COLLEGE, KUTA SHIRORO NIGER STATE

1. Number of teachers teaching welding and fabrication is ...Two...(2).....
2. Number of technicians (instructors) at the welding and fabrication workshop is...Two.(2)...
3. Number of students offering welding and fabrication is ~~Fourteen~~...(14)

4. Number of administrators is Six (6)

VP ACADEMIC II
FED. SCI. AND TECH. COLL.
KUTA SHIRORO

13/7/2021

APPENDIX C

Result Analysis

CHAPTER ONE

```
FREQUENCIES VARIABLES=RQ1I1 RQ1I2 RQ1I3 RQ1I4 RQ1I5 RQ1I6 RQ1I7
RQ1I8 RQ1I9 RQ1I10 RQ1I11 RQ1I12
   RQ1I13 RQ1I14 RQ1I15 RQ1I16 RQ1I17 RQ1I18 RQ1I19 RQ1I20 RQ1I21
RQ1I22 RQ1I23 RQ1I24 RQ1I25 RQ1I26
   RQ1I27
  /STATISTICS=STDDEV MEAN
  /ORDER=ANALYSIS.
```

Frequencies


```
FREQUENCIES VARIABLES=RQ1I1 RQ1I2 RQ1I3 RQ1I4 RQ1I5 RQ1I6 RQ1I7
RQ1I8 RQ1I9 RQ1I10 RQ1I11 RQ1I12
   RQ1I13 RQ1I14 RQ1I15 RQ1I16 RQ1I17 RQ1I18 RQ1I19 RQ1I20 RQ1I21
RQ1I22 RQ1I23 RQ1I24 RQ1I25 RQ1I26
   RQ1I27
  /STATISTICS=STDDEV MEAN
  /ORDER=ANALYSIS.
```


Frequencies

Lathe machines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	28	60.9	63.6	63.6
	2.00	16	34.8	36.4	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Shaping machines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	36	78.3	81.8	81.8
	2.00	8	17.4	18.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Drilling machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	24	52.2	54.5	54.5
	2.00	20	43.5	45.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Arc and Gas welding machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	76.1	79.5	79.5
	2.00	9	19.6	20.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Grinding machines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Filling machines

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	54.3	56.8	56.8
	2.00	19	41.3	43.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Sprayers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	32	69.6	72.7	72.7
	2.00	12	26.1	27.3	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Power hack saw machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	76.1	79.5	79.5
	2.00	9	19.6	20.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Electric shear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	19	41.3	43.2	43.2
	2.00	25	54.3	56.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Oxy-acetylene welding equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	30	65.2	68.2	68.2
	2.00	14	30.4	31.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Spot welding machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	15	32.6	34.1	34.1
	2.00	29	63.0	65.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Disc cutting machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	54.3	56.8	56.8
	2.00	19	41.3	43.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Profile cutting machine with gas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Folding machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	56.5	59.1	59.1
	2.00	18	39.1	40.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Circular cutting machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	18	39.1	40.9	40.9
	2.00	26	56.5	59.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Universal beading and swaging machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Hand nibbling machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Clamps(assorted)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Furnace

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	56.5	59.1	59.1
	2.00	18	39.1	40.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Vee block(assorted)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	54.3	56.8	56.8
	2.00	19	41.3	43.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Swage block

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

AC Transformer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	37	80.4	84.1	84.1
	2.00	7	15.2	15.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Guillotine Machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	22	47.8	50.0	50.0
	2.00	22	47.8	50.0	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Laser Beam Machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	40	87.0	90.9	90.9
	2.00	4	8.7	9.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Tungsten Inert Gas (TIG) Machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	27	58.7	61.4	61.4
	2.00	17	37.0	38.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Automated Welding Machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Metal Inert Gas (MIG) Machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	19	41.3	43.2	43.2
	2.00	25	54.3	56.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

```
FREQUENCIES VARIABLES=RQ2I1 RQ2I2 RQ2I3 RQ2I4 RQ2I5 RQ2I6 RQ2I7
RQ2I8 RQ2I9 RQ2I10 RQ2I11 RQ2I12
   RQ2I13 RQ2I14 RQ2I15 RQ2I16 RQ2I17 RQ2I18 RQ2I19 RQ2I20 RQ2I21
RQ2I22 RQ2I23 RQ2I24 RQ2I25 RQ2I26
   RQ2I27 RQ2I28 RQ2I29 RQ2I30 RQ2I31 RQ2I32 RQ2I33 RQ2I34 RQ2I35
RQ2I36 RQ2I37 RQ2I38 RQ2I39 RQ2I40
   RQ2I41 RQ2I42 RQ2143 RQ2I44
  /STATISTICS=STDDEV MEAN
  /ORDER=ANALYSIS.
```

Frequency Table

Hammer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	14	30.4	31.8	31.8
	2.00	30	65.2	68.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Chisel

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

File

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	25	54.3	56.8	56.8
	2.00	19	41.3	43.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Hacksaw

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Tongs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Micrometer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Venier caliper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	20	43.5	45.5	45.5
	2.00	24	52.2	54.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Steel rule

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	31	67.4	70.5	70.5
	2.00	13	28.3	29.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Dot punch

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	22	47.8	50.0	50.0
	2.00	22	47.8	50.0	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Odd-leg caliper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	24	52.2	54.5	54.5
	2.00	20	43.5	45.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Try square

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Combination set

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Inside and outside caliper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Venier protractor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Bevel guage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	27	58.7	61.4	61.4
	2.00	17	37.0	38.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Electric shear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	24	52.2	54.5	54.5
	2.00	20	43.5	45.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Plier

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	22	47.8	50.0	50.0
	2.00	22	47.8	50.0	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Rivet gun

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	21	45.7	47.7	47.7
	2.00	23	50.0	52.3	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Template

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	22	47.8	50.0	50.0
	2.00	22	47.8	50.0	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Safety google

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	63.0	65.9	65.9
	2.00	15	32.6	34.1	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Apron

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	56.5	59.1	59.1
	2.00	18	39.1	40.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Safety boot

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	41	89.1	93.2	93.2
	2.00	3	6.5	6.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Soldering bit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	56.5	59.1	59.1
	2.00	18	39.1	40.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Centre punch

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	20	43.5	45.5	45.5
	2.00	24	52.2	54.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Scriber

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	30	65.2	68.2	68.2
	2.00	14	30.4	31.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Spring divider

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	76.1	79.5	79.5
	2.00	9	19.6	20.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Shear snips

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	22	47.8	50.0	50.0
	2.00	22	47.8	50.0	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Mole grips

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	36	78.3	81.8	81.8
	2.00	8	17.4	18.2	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Divider

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	19	41.3	43.2	43.2
	2.00	25	54.3	56.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Mallets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	24	52.2	54.5	54.5
	2.00	20	43.5	45.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Hand shears/table shears

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	28	60.9	63.6	63.6
	2.00	16	34.8	36.4	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Rivet sets/riveter

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	26	56.5	59.1	59.1
	2.00	18	39.1	40.9	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Engineer hand vice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	23	50.0	52.3	52.3
	2.00	21	45.7	47.7	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Soldering stoves

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Drill bits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Reamer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	30	65.2	68.2	68.2
	2.00	14	30.4	31.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Grooving punch

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	21	45.7	47.7	47.7
	2.00	23	50.0	52.3	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Bending role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	28	60.9	63.6	63.6
	2.00	16	34.8	36.4	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Straight snips

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	20	43.5	45.5	45.5
	2.00	24	52.2	54.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Anvil

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	30	65.2	68.2	68.2
	2.00	14	30.4	31.8	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Respirator

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	16	34.8	36.4	36.4
	2.00	28	60.9	63.6	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Rivet gun

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	35	76.1	79.5	79.5
	2.00	9	19.6	20.5	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

Hand nibbling machine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	21	45.7	47.7	47.7
	2.00	23	50.0	52.3	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

table shears

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	32	69.6	72.7	72.7
	2.00	12	26.1	27.3	100.0
	Total	44	95.7	100.0	
Missing	System	2	4.3		
Total		46	100.0		

CHAPTER 3

```
COMPUTE
MEAN3OR=MEAN(RQ3I1,RQ3I2,RQ3I3,RQ3I4,RQ3I5,RQ3I6,RQ3I7,RQ3I8,RQ3I9,
RQ3I10,RQ3I11,RQ3I12,

RQ3I13,RQ3I14,RQ3I15,RQ3I16,RQ3I17,RQ3I18,RQ3I19,RQ3I20,RQ3I21,RQ3I22,R
Q3I23,RQ3I24).
EXECUTE.
DESCRIPTIVES VARIABLES=RQ3I1 RQ3I2 RQ3I3 RQ3I4 RQ3I5 RQ3I6 RQ3I7
RQ3I8 RQ3I9 RQ3I10 RQ3I11 RQ3I12
   RQ3I13 RQ3I14 RQ3I15 RQ3I16 RQ3I17 RQ3I18 RQ3I19 RQ3I20 RQ3I21
RQ3I22 RQ3I23 RQ3I24
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Angle grinding wheels	44	2.00	3.00	2.9091	.29080
Filler rods	44	2.00	3.00	2.8636	.34714
Parent Plates or Pipes (Materials)	44	2.00	3.00	2.9545	.21071
Solid Wires	44	2.00	4.00	3.0682	.50106
Welding wires	44	2.00	4.00	2.9773	.54936
Electrodes	44	3.00	4.00	3.4545	.50369
Fluxes	44	3.00	4.00	3.3182	.47116
Saw Wires	44	3.00	4.00	3.5682	.50106
Flux cored Wires	44	3.00	4.00	3.3864	.49254
Paints	44	2.00	3.00	2.4091	.49735
Filler Wires	44	2.00	2.00	2.0000	.00000
Shielding Gas	44	2.00	4.00	2.6136	.53769
Gases (Hydrogen, Ammonia, Carbondioxide)	44	2.00	3.00	2.8864	.32104
Mild steel hollow	44	2.00	3.00	2.8864	.32104
Square steel hollow	44	2.00	3.00	2.8636	.34714
Rectangular steel hollow	44	2.00	3.00	2.6591	.47949
Angular steel hollow	44	3.00	3.00	3.0000	.00000
Steel pipe	44	3.00	4.00	3.1364	.34714
Circular hollow	44	3.00	4.00	3.1364	.34714
Alloy steel	44	2.00	3.00	2.7500	.43802
Stainless steel	44	2.00	4.00	3.2045	.55320
Carbon steel	44	2.00	4.00	2.8409	.52576
Galvanized steel	44	3.00	4.00	3.4545	.50369
Tool steel	44	2.00	3.00	2.9091	.29080
Valid N (listwise)	44				

```
T-TEST GROUPS=Nameofcategories(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=MEAN3OR
  /CRITERIA=CI(.95).
```

T-Test

Group Statistics

	Nameofcategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN3OR	schoolA	27	2.9568	.09770	.01880
	Teacher	17	2.9877	.06713	.01628

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEAN3OR	Equal variances assumed	5.770	.021	-1.145	42	.259	-.03095	.02704	-.08552	.02361
	Equal variances not assumed			-1.245	41.602	.220	-.03095	.02487	-.08116	.01925

CHAPTER 4
DESCRIPTIVES VARIABLES=RQ4I1 RQ4I2 RQ4I3 RQ4I4 RQ4I5
/STATISTICS=MEAN STDDEV MIN MAX.

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Teachers available for teaching in class 30	44	3.00	4.00	3.5909	.49735
Technicians available to train 30 students of welding and fabrication in workshop	44	3.00	4.00	3.9773	.15076
Workshop assistants available to assist the technicians during training of 30 students	44	3.00	4.00	3.9773	.15076
Cleaners to clean workshop, classrooms and offices after daily activities.	44	2.00	4.00	3.3864	.75378
Administrators for the school affairs	44	3.00	4.00	3.4545	.50369
Valid N (listwise)	44				

```
COMPUTE mean4=MEAN(RQ4I1,RQ4I2,RQ4I3,RQ4I4,RQ4I5).
EXECUTE.
T-TEST GROUPS=Nameofcategories(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=mean4
  /CRITERIA=CI(.95).
```

T-Test

Group Statistics

	Nameofcategories	N	Mean	Std. Deviation	Std. Error Mean
mean4	schoolA	27	3.5185	.25576	.04922
	Teacher	17	3.9294	.12127	.02941

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
mean4	Equal variances assumed	16.327	.000	-6.181	42	.000	-.41089	.06647	-.54504	-.27674
	Equal variances not assumed			-7.166	39.664	.000	-.41089	.05734	-.52681	-.29498

CHAPTER FIVE

```
COMPUTE
MEAN5OR=MEAN(RQ5I1,RQ5I2,RQ5I3,RQ5I4,RQ5I5,RQ5I6,RQ5I7,RQ5I8,RQ5I9,
RQ5I10,RQ5I11,RQ5I12,
   RQ5I13, RQ5I14, RQ5I15).
EXECUTE.
DESCRIPTIVES VARIABLES=RQ5I1 RQ5I2 RQ5I3 RQ5I4 RQ5I5 RQ5I6 RQ5I7
RQ5I8 RQ5I9 RQ5I10 RQ5I11 RQ5I12
   RQ5I13 RQ5I14 RQ5I15
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Projectors	44	3.00	4.00	3.5682	.50106
Instructional Laboratories (Auto Card)	44	3.00	4.00	3.3864	.49254
Magic board	44	2.00	3.00	2.4091	.49735
Screens	44	2.00	2.00	2.0000	.00000
Computers	44	2.00	3.00	2.5909	.49735
Standard Drawing Studios	44	2.00	3.00	2.8864	.32104
Internet Service	44	2.00	3.00	2.8864	.32104
White/Chalk Board	44	2.00	3.00	2.8636	.34714
Flips Board	44	2.00	3.00	2.6591	.47949
Visual realities goggles	44	2.00	3.00	2.6591	.47949
Manuals	44	3.00	3.00	3.0000	.00000
Textbooks	44	3.00	4.00	3.1364	.34714
Study Guide	44	3.00	4.00	3.1364	.34714
Slides	44	2.00	3.00	2.7500	.43802
Graphing Calculations	44	2.00	4.00	3.2045	.55320
Valid N (listwise)	44				

```
T-TEST GROUPS=Nameofcategories(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=MEAN5OR
  /CRITERIA=CI(.95).
```

T-Test

Group Statistics

	Nameofcategories	N	Mean	Std. Deviation	Std. Error Mean
MEAN5OR	schoolA	27	2.8494	.15314	.02947
	Teacher	17	2.9176	.05016	.01217

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEAN5OR	Equal variances assumed	73.183	.000	-1.772	42	.084	-.06826	.03852	-.14599	.00946
	Equal variances not assumed			-2.141	34.012	.040	-.06826	.03188	-.13306	-.00347

APPENDIX D

NATIONAL BOARD FOR TECHNICAL EDUCATION
(NBTE) KADUNA
Address: Plot B, Bida Road, PMB 2239, Kaduna, Nigeria.

Curriculum Table (NTC)

Curriculum Course Specification and Hours/Week

PROGRAMME: NATIONAL TECHNICAL CERTIFICATE IN FABRICATION AND WELDING TRADE

			YEAR 1						YEAR 2						YEAR 3						
S/ No	**Subject Code**	**Module**	Term 1		Term 2		Term 3		Term 1		Term 2		Term 3		Term 1		Term 2		Term 3		**Total Hours for each**
			T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	**216**
	CTD 193	Building/Engineering Drawing	-	3	-	3	-	3	-	3	-	3	-	3	-	2	-	2	-	2	288
	CEM 11	General Metal Work I	2	5	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168
	CME 12	General Metal Work II	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	60
	CFW 11	Sheet Metal Work I	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	-	-	216
	CFW 12	Gas Welding and Cutting	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	-	-	216
	CFW 13	Metal Arc Welding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	216
	CFW 14	Structural Steel Work	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	216
	CFW 11	Sheet Metal Work II	-	-	-	-	-	-	-	-	-	-	2	6	2	5	-	-	-	-	180

APPENDIX E

NATIONAL BOARD FOR TECHNICAL EDUCATION
(NBTE) KADUNA
Address: Plot B, Bida Road, PMB 2239, Kaduna, Nigeria.

MINIMUM REQUIREMENT FOR TEACHING FABRICATION AND WELDING TRADE TOOLS AND EQUIPMENT.

S/N	Tools and Equipment	MINIMUM QUANTITY REQUIRED	QUANTITY AVAILABLE	QUANTITY AVAILABLE
	Power guillotine of capacity 10swg x 36 in length	2		
	Treadle guillotine of capacity 20swg x 36 length	2		
	Swing beam folder 10swg x 3'-6' Capacity	2		
	Bending roller capacity 40"x2" Dia	2		
	Bending roller capacity 18"x11/4 Dia	2		
	Bench mounted cone roller	5		
	Hand-operated copper capacity 3/32 in mild steel	5		
	Power bench grinding machine	2		
	Double-ended buffer and polisher	2		
	Universal beading and swaging Machine	2		
	Power-operated drilling machine maximum capacity 3/8"	2		
	Wheeling machine	2		
	Fly Press	1		
	Hand nibbling Machine	2		
	Left and right hand snips	5 each		
	Straight snips	5		
	A "kit" of tools consisting of hammer, mallet, steel rule, scriber and wing compass, etc.	5		

	Bench shears	2		
	Power saw cutting machine 10mm	2		
	Disc cutting machine	2		
	Profile cutting machine with gas cutting nozzles	2		
	Piller drilling machine	2		
	Louver shearing machine (manual)	2		
	Overhead crane	1		
	Straightening machine	2		
	Cropping machine	2		
	Straight edge	10		
	Trammels dividers (set)	10		
	Hammers	10		
	Chisels	10		
	Punches	10		
	Try-squares	10		
	Steel rules	2		
	Smith open forge	2		
	Vee blocks	10		
	Electrode holders	10		
	Electrode drying oven	2		
	Heavy duty grinding machine	2		
	Bench-type grinding machine	2		
	CO_2 cylinders	5		
	Transformers With rectifiers (with all Instruments)	10		
	Aprons (assorted	20		
	Hand gloves	20		
	Hand shields and head caps	10		
	Wire brushes	10		
	Electrical beaters	2		
	Pliers – assorted	10		
	Gas welding goggles	5		
	Double cylinder trolley	2		
	Oxygen regulators	5		
	Acetylene regulators	5		
	Hoses and clips and all attachments set	5		
	Blowpipes (low and high Pressure	5		
	Tongs	5		
	Combined set of cutting welding Outfit	5		
	Power operated profile cutter with turntable	2		
	D.C generators with all	5		

	Connections			
	A.C transformer (Argon) with all the connections	5		
	Argon cylinders	5		
	Regulators with flow meters	5		
	Hacksaw and blades	24		
	Water to carbide generators	4		
	Carbide to water generators	4		
	Overhead projector	1		
	Computer set	1		
	ANVIL	2		
	Swage block	2		
	Chipping hammers	20		
	Plain goggles	20		
	First aid box	2		
	Sledge Hammer	2		
	G. Clamps – assorted	26		
	Self grip pliers – assorted	6		
	Magnetic clamp	3		
	Flatters	6		
	Molegrip	6		