

CONCEPTUAL MODEL FOR TECHNICAL AND EMPLOYABILITY SKILLS
OF NIGERIAN MECHANICAL ENGINEERING TRADES PROGRAMME

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This thesis is dedicated to the entire families of Alhaji Adamu Audu Bida, late Alhaji Audu Kongila Bida, my wife and children for their endless support and encouragement.

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ABSTRACT

Vocational and Technical education is designed to produce competent craftsmen, semi-skilled workers and sub-professionals for various sectors of the economy. Upon graduation, graduates are expected to be secure a job either in the labor market or self-employed. However industries and employers are constantly complaining about the quality of these graduates in terms of employability and technical skills. In addition, these graduates are lack of technical competencies to be self-employed. Therefore, this study evaluated the technical and employability skills of a Mechanical Engineering Trades (METs) program at technical colleges in the North Central States, Nigeria. Specifically, this study identified the teaching method which influence the acquisition of technical and employability skills METs students and determined the suitability of infrastructural facilities. A mixed method research design which utilized structured questionnaire, interview protocol, observation and document analysis was used. 444 respondents comprising of 267 METs students, 99 METs teachers, 46 administrators and 32 workshop instructors were participated in the study. Data were analyzes using SPSS software version 20 and Analysis of Moment of Structure (AMOS) version 18 to analyze quantitative data whereas qualitative data were analyzed using transcription, coding and categorization procedures. The findings of this study revealed that the teaching methods employed by METs teachers were mostly lectures and demonstration. The METS students' competency levels with regards to technical and employability skills are at moderate level. The findings of the study also listed some of the challenges faced by the teacher including lack of adequate provision of instructional materials, no standard workshops for teaching and learning of METs in most technical colleges, teachers are not encouraged to attend seminars and workshops to update their knowledge. The findings also indicated that the teaching methods which greatly influence the acquisition of technical and employability skills are work based learning, field trip, discussion based on tutorial learning project and seminar, demonstration and discussion. This study also found that that most of the facilities in the colleges are in a state of disrepair. Based on these findings, it is recommended that the government, industries and other non-governmental organizations should provide financial assistance for the technical college programs especially METs. Besides that, these colleges should have collaborations with industries. A significant contribution of this study is the development of a conceptual model for an effective implementation of METs program for technical colleges in Nigeria.

ABSTRAK

Pendidikan teknikal dan vokasional direkabentuk untuk melahirkan pekerja mahir, separuh mahir dan sub-profesional untuk pelbagai sektor ekonomi. Selepas tamat pengajian, graduan dijangkakan akan bekerja di pasaran kerja atau bekerja sendiri. Bagaimanapun industri dan majikan sentiasa memberikan respon negatif tentang kualiti graduan dari segi kemahiran kebolehpasaran pekerjaan dan kemahiran teknikal. Di samping itu, graduan ini kekurangan keupayaan teknikal untuk bekerja sendiri. Oleh itu, kajian ini dijalankan untuk menilai kemahiran teknikal dan kebolehpasaran pekerjaan bagi program Kejuruteraan Mekanikal Ketukangan (METs) di kolej-kolej teknikal di bahagian Utara, Nigeria. Secara khusus, kajian ini mengenalpasti kaedah pengajaran yang mempengaruhi pelajar METs untuk mendapat kemahiran teknikal dan kemahiran kebolehpasaran pekerjaan dan ditentukan dengan kesesuaian kemudahan infrastruktur. Reka bentuk kajian ini menggunakan kaedah campuran yang menggunakan soal selidik berstruktur, protokol temubual, pemerhatian dan analisis dokumen. 444 responden yang terdiri daripada 267 pelajar METs, 99 guru METs, 46 pentadbir dan 32 pengajar bengkel telah mengambil bahagian dalam kajian ini. Data dianalisis menggunakan perisian SPSS versi 20 dan *Analisis Moment Struktur* (AMOS) versi 18 untuk menganalisis data kuantitatif manakala data kualitatif telah dianalisis dengan menggunakan transkripsi, pengkodan dan pengkategorian prosedur. Hasil kajian ini menunjukkan bahawa kaedah pengajaran yang digunakan oleh guru-guru METs kebanyakannya secara kuliah dan demonstrasi. Tahap kecekapan pelajar METs berkaitan dengan kemahiran teknikal dan kemahiran kebolehpasaran pekerjaan berada pada tahap sederhana. Dapatan kajian ini juga menyenaraikan beberapa cabaran yang dihadapi oleh guru seperti kekurangan peruntukan yang mencukupi bagi bahan pengajaran, tiada bengkel teknikal yang standard untuk pengajaran dan pembelajaran di kolej METs, guru tidak diberi galakkan untuk menghadiri seminar dan bengkel untuk mempertingkatkan pengetahuan mereka. Dapatan kajian ini juga menunjukkan bahawa kaedah pengajaran yang amat mempengaruhi kemahiran teknikal dan kebolehpasaran pekerjaan adalah pembelajaran berasaskan kerja lapangan, lawatan sambil belajar, perbincangan berdasarkan projek pembelajaran tutorial dan seminar, demonstrasi dan perbincangan. Kajian ini juga mendapati bahawa kebanyakan kemudahan di kolej-kolej berada dalam keadaan yang teruk. Berdasarkan penemuan ini, adalah disyorkan bahawa kerajaan, industri dan badan-badan bukan kerajaan memainkan peranan dalam menyediakan bantuan kewangan untuk program kolej teknikal terutama METs. Di samping itu, kolej juga harus menjalinhubungan kerjasama dengan industri. Sumbangan penting kajian ini ialah pembangunan model konseptual untuk keberkesanan pelaksanaan program METs untuk kolej-kolej teknikal di Nigeria.

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LIST OF ACRONYMS

ACR	-	Air-Conditioning and Refrigeration
AfDB	-	African Development Bank
AMOS	-	Analysis of Moment of Structures
ANCC	-	Advance National Commercial Certificate
ANOVA	-	Analysis of Variance
ANTC	-	Advance National Technical Certificate
BEST	-	Basic Engineering Skills Training
CIPP	-	Context, Input, Process and Product
CNC	-	Computerized Numerical Control
DfID	-	Department for International Development
FCT	-	Federal Capital Territory
FME	-	Federal Ministry of Education
FRN	-	Federal Republic of Nigeria
FSTC	-	Federal Science and Technical College
GTC	-	Government Technical College
HND	-	Higher National Diploma
ILO	-	International Labor Organization
JSS	-	Junior Secondary School
JSSC	-	Junior Secondary School Certificate
MECP	-	Mechanical Engineering Craft Practice
METs	-	Mechanical Engineering Trades
MVM	-	Motor Vehicle Mechanics
NABTEB	-	National Business and Technical Examination Board
NBTE	-	National Board for Technical Education
NCC	-	National Commercial Certificate
ND	-	National Diploma

NERC	-	National Educational Research Council
NICHE	-	Netherland Initiatives for Capacity development in Higher Education
NPE	-	National Policy on Education
NTC	-	National Technical Certificate
PBL	-	Problem Based Learning
SAP	-	Structural Adjustment Program
SEM	-	Structural Equation Modeling
SIWES	-	Students Industrial Work Experience Scheme
SPSS	-	Statistical Package for Social Sciences
SSS	-	Senior Secondary School
TVE	-	Technical Vocational Education
TVET	-	Technical Vocational Education and Training
UBE	-	Universal Basic Education
UNESCO	-	United Nations Educational Scientific and Cultural Organizations
VTC	-	Vocational Training Council
VTCC	-	Vocational Training Center Certificate
WAEC	-	West African Examination Council
WBL	-	Work Based Learning
WFCP	-	Welding Fabrication Craft Practice

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Technical Vocational Education (TVE) has been a key component of national development plans in industrialized nations as a result of its impact on productivity, economic and industrial advancement (Dike, 2009a). Afeti (2007) defined TVE as that kind of education that fits the individual for profitable job in a particular career as semi-skilled workers or skilled workers or sub-professionals. TVE could be referred to as that aspect of education, which provides its receivers with the basic cognitive and practical skills necessary for entrance into the labor market as employees or as self-employed.

According to Maclean and Wilson (2009) the goal of TVE is the acquisition of skills and knowledge of the individual for employment and sustainable living. Secondary schools in developed countries have TVE institutions that train the students for the creation of employment. As a mark of the huge impacts skilled employees make to organizational progress and growth; establishments in industrialized countries spend huge amount of funds yearly on employees' skill improvement and retraining programs. More significantly, the 'knowledge-driven' worldwide economy demands an educational program that advances not merely academic knowledge and occupational skills, but also problem solving skills, critical thinkers' creative and generally responsible populace. Abassah (2011) stated that technical education involves training in the process of relating both science and technological training to practical problems right from primary to higher level of

education; this is because it aims at developing practical skills as well as the creative and innovative powers that enable decision making skills and problem solving abilities.

Vocational training is referred to as that form of instruction, which builds up the mental and physical attributes of the populace thereby, improving their skills, and knowledge needed for the utilization of the physical resources required for commercial growth of the country and for self-employment. The term vocational education is referring to the type of education whose main function is to train individuals for work in recognized professions Okorie (Enyekit, *eta l.*, 2011). The main aim of all TVE programs is the acquirement of skills and competences for profitable employment in a particular profession or vocation. The necessity to relate training and employment either personal or paid employment is the basis of the whole most excellent practices and approaches adhered to generally. One of the most vital features of TVE is its emphasis to employment and the curriculum also stresses on the acquirement of skills for gainful employment. TVE provisions are found to train the skilled workers that the nation requires to generate wealth and come out of abject penury. One important attribute of TVE is that it can be provided at diverse levels of sophistication. This implies that TVE can answer not entirely to the demands of various kinds of industries, but likewise to different requirements of students from diverse socioeconomic and educational settings, and organize them for employment and sustainable living. A skilled employee is a basic need which serves as an instrument for industrial and economic development, and TVE is important for getting the right type of technical and entrepreneurial workforce (Afeti, 2009).

1.1.1 Mechanical Engineering Trades

Mechanical Engineering Trades (METs) is a common term that is being utilized in defining trades that are having complete bearing with metal welding/forming and or servicing/repairs of machines or machine related equipment and appliances. The occupations in this category comprises of agricultural implement and equipment mechanic work, motor vehicle mechanics work, auto body repair and

spray painting, auto electrical work, auto body building, auto parts merchandising, air-conditioning and refrigeration mechanics work, mechanical engineering craft practice, welding and fabrication engineering craft practice, foundry craft practice, instruments mechanics work and marine engineering craft (Peter, *eta l.*, 2010). Mechanical engineering education comprises of training and learning on how to productively employ the use of strong scientific and mathematical base for the design of safe, dependable, environmentally sound, and cost efficient techniques. At advanced degree levels, Mechanical Engineers carry out major research required to gain skills and knowledge in the engineering sciences (Dublin Institute of Technology, 2008).

Australian Apprenticeships Pathways (2011) observed that METs are related to most industrial sectors which include: mining, minerals processing, chemical processing, building, health, pharmaceutical, oil and gas, manufacturing, automotive, communications, electrical power generation and distribution, water and waste, natural gas distribution, transport, fishing and food processing. METs also consists of manufacture, installation, testing, operation and maintenance of machines, mechanical and mechatronics systems, automated systems and robotic devices, heat transfer processes, thermodynamic and combustion systems, fluid and thermal energy systems, materials and materials handling systems, manufacturing equipment and process plant. According to Dublin Institute of Technology (2008) mechanical engineers work is in practically every specialized discipline imaginable, including automotive, computer aided design, biomedical engineering, aerospace, energy and environmental systems. Indeed, mechanical engineering education is the most liberal of all engineering fields, with the broadest applicability and most flexibility in terms of occupations.

The subsistence of any industry is mostly relied on the availability of METs craftsmen. Abdullahi (Atsumbe, *eta l.*, 2012) asserted that for any industry in Nigeria either mechanical or civil to keep on production, it would need the services of skilled mechanical engineering craftsmen. He further emphasized that it is the mechanical engineering craftsman who actually carryout the designs, plans and the projects of the mechanical engineer. Mechanical engineering craftsmen are involved in services

which includes; fabrication of spare parts to specifications; carrying out routine maintenance of equipment and tools. The job of a mechanical engineering craftsman is multi-facet, some of his jobs involve plant and equipment maintenance, operating on the CNC machines, align and fix mechanical components, fabrication of die sinkers, structural iron work and being a tool maker amongst others Kibbe, *eta l.*, (Atsumbe, *eta l.*, 2012). Therefore, it is a fact that efficient training in skills improvement in engineering trades either soft or hard skills has greatly contributed to the technological development and economic self-reliance of individuals and industrialized nations.

1.1.2 Technical Skills and Employability Skills

Technical skills in any type of industrial set-up either manufacturing or service industry is also important. Johannsen (2012) defined technical skills as the knowledge of techniques, practices, procedures, and methods of carrying out a specialized task and the skills to operate tools and equipment that are related to that task. Where students are lead to actual operating situation by practically utilizing the skills, competences and knowledge they acquired the process of education will be more efficient and effective. This condition can only be accomplished where there is collaboration between the training institutes and also the industries. In the developed nations for instance United States of America, Germany and Japan, the partnership between the training institutions and the industries have been integrated for decades. The curriculum must be organized in such a way that it allows for the evaluation of the learner's level of achievement in getting used to the exact operational conditions, in knowledge improvement and incapability to relate the theories and concepts they already learnt. Partnership between the formal and informal sectors, faculties, schools and industries, and business establishments in addition to collaboration expanding to integrate the learners is likely to develop in importance in the early part of the 21st century (Zakaria, *eta l.*, 2011). Apart from technical skills, employability skills are also very important in the 21st century.

Employability skills are the types of skills that assist the individual to carry out his job efficiently and effectively in the workplace. It is non-technical skills and could be termed to as; 'soft skills' or 'transferable skills' or 'generic skills'. The employability skills comprises of basic skills, resource skills, thinking skills, interactive skills, information skills, personal skills system and technology skills (Clarke, 2007). Employability skills are those necessary abilities that are essential for securing, maintaining, and performing efficiently on the job. These are the abilities or skills, approaches and activities that allow employees to relate to with their colleagues and managers to be able to come up with critical decisions. Unlike technical skills, employability skills are generic in nature rather than for specific jobs and therefore cuts across different types of industries, job levels and business sizes, from the new level employees to the most senior positions. (Robinson and Garton, 2008).

Employability skill are set of vital skills inculcated in individuals to create useful labor force Overtom (Kazilan, *eta l.*, 2009). This can be compared with persons who have great attributes for instance a high sense of self-novelty, productivity, skilful, and competitiveness, a high sense of willpower, and creativity in tackling problems of the country as well as globalization in the present-day 21st century. Also, employability skills are essential in all occupations and also in training. Employability skills are skills that relate and cut across different types of jobs and life contexts. They are most a times referred to as necessary skills, key skills, life skills, key competencies, essential skills, core skills, and transferable skills. According to Robinson, *eta l.*, (2007) there is a great need for educated people with generic employability skills and specific technical skills. Employees in the 21st century require skills for example communication skills, analytical skills and problem-solving, organization and time management, decision-making and risk-taking, to be able to be employable in the labor force.

1.2 Background of the Study

Technical Vocational Education (TVE) occupies a very vital position in the technological development of many nations. The provisions of TVE in any country of the world today is immense, therefore, it occupies a very vital role in the nation's growth. TVE is a designed program of activities and learning practices that arises from the study of career choices, provisions of major literary and lifelong skills, and assists in the attainment of high academic degrees, management level training for industrial work, and highly developed lifelong learning (Maclean and Wilson, 2009). Despite the numerous contributions of TVE to national growth, this form of education has not been given the due attention it deserves in Nigeria (Dike, 2009). Dike further states that this attitude has led to the neglect of TVE institutions and therefore, for this reason most of the youth shy away from TVE.

In Nigeria technical college is considered as the main vocational institution. METs program is one the program offered in technical colleges. Several studies have been carried out on METs, in a study on motor vehicle mechanics which is an aspect of METs, the study showed that the graduates of these programs lacked the fundamental skills required for productive employment in today's motor vehicle industry (Jimoh, 1997; Elobuike, 1999; Agbata, 2000; Matthew and Ede, 2011). The program or curriculum was attributed for being deficient and not appropriate to provide adequate skills required to meet up with the challenge that is essential in maintenance and services of modern vehicles that ply on the Nigerian roads (Matthew and Ede, 2011). The integration of modern technologies with latest subsystems and system mechanisms in recent automobiles vehicles have improved their formations and rendered the vehicles maintenance a difficult task, at the same time some modern vehicles systems make them simpler to maintain.

The curriculum of technical colleges which is use in the training of the workforces for the maintenance of the automobile vehicles continuous to remain rigid since 1985, therefore, far away from the modern technological advancement in motor vehicles National Board for Technical Education (NBTE, 2001). As a result of the fact that the curriculum of technical college programs have remain rigid and not

up-to-date the need to revisit and overhaul the curriculum of technical colleges in Nigeria to be able to train technical college graduates to meet up with the requirements of the industries in terms skills required by the industries for employment. The gaps established between the curriculum and the new technological innovations have made the required skills for actual maintenance of these modern automobiles vehicles to continue to escape the products of this program. The consequence is that most of the graduates of the programs are usually not employable whereas majority of the automobiles vehicles with the latest improvements also have the new systems changed by means of the conventional substitute systems that the modern ones are meant to improve on or suffer disrepair. Nevertheless, some of the automobiles are even totally grounded barely into their expected service lives as a result of inadequate or lack of skilled personnel for the effective maintenance of the vehicles (Matthew and Ede, 2011).

Based on the problems identified in the background of the study which revealed that graduates of METs lack the basic skills that is required for gainful employment in the world of work. This situation might be as a result of the fact that the curriculum is rigid and out dated and most of the institutions lack basic tools and equipment for practical skills acquisition (NBTE, 2001). It is for this reason that the FRN (2004) in the NPE emphasize on the role of TVE in economic and national development and the need for collaboration between technological institutions and the industries which will be discussed in the subsequent sub-headings.

1.2.1 TVE and the National Policy of Education in Nigeria

The development of any nation is hinged on its technological development and this is determined by the quality of the nation's TVE Aluwong and Awotunde (Audu, 2008). For Nigeria to realize its dream of vision 2020 greater emphasis must be given to TVE because TVE is the basis of technological advancement of most developed nations. Nevertheless, the contribution of TVE in most nations of the globe today is enormous, so it plays a very important part in the national and economic development of any country. The FRN (2004) in the NPE appreciates the

fact that the most important means of experiencing national development is through strong TVE programs at all levels of education. The basic necessities of life that will ensure good living can only be provided through efficient and functional technology education. These basic needs can be classified into the followings: adequate food supply through agriculture, effective health care services, transportation, communication, power supply, good network of roads water supply to mention but a few. In Nigeria, TVE at post primary school level is planned to prepare students with the knowledge, skills and attributes for the purpose of making a living (either self-employed or an employer of labor or be employable (Onyene, *eta l.*, 2007a).

In line with this statement, the FRN in NPE states that:

“TVE is used as a comprehensive term referring to those aspects of the educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of the economic and social life” (FRN, 2004:29)”

The policy further states that, the goals of TVE are:

- i to provide trained manpower in the applied science and business particularly at craft, advanced craft and technical levels.
- ii to provide the technical and vocational skills necessary for agricultural, commercial and economic development;
- iii to give training and impart necessary skills to individual who shall be self-reliant economically (FRN, 2004:30).

In pursuance of the stated goals, the national policy on education further states that: The trainees completing technical college programs shall have three options:

- i secure employment at the end of the whole course or after completing one or two modules of employable skills.
- ii set up their own business and become self-employed and be able to employ others;
- iii pursue further education in advance craft/technical program and in post – secondary (tertiary) technical institutions such as science and technical colleges, polytechnics or colleges of education (technical) and universities (FRN, 2004:31).

A close look at the aims and objectives of TVE in the NPE shows the justification for government's interest and support for the skill-orientated education. TVE has impacted significantly to economic growth thereby, bringing down the level of unemployment as a result of access to different earnings, supporting direct foreign investment and basically changing mind-sets of people towards TVE, apart from offering skilled workforces and reducing youth unemployment (Adebambo, 2007). The rapid progression and changes in industries has brought many challenges and competition in the economy of the world in the aspect of technology, marketing, information technology, services and manufacturing. Employees in these areas are supposed to be highly knowledgeable with respect to "hard" technical skills and "soft" generic skills to maintain and serve demands of the society and industry (Wan-Mohamed and Yunus, 2009).

1.2.2 Existing Gap between Industries and Technical Institutions

Technological institutions are supposed to train graduates so that upon completion of their programs they are supposed to have acquired skills to be able to be employed in industries and other related organizations or become self-employed. However, the industries and employers of labor have kept on complaining that METs graduates are not usable without further training. This assertion was supported by Olorunfemi and Ashaolu (2008) who stated that, most of the industries in Nigeria have expressed their worry over the quality of METs graduates in terms of possessing low practical knowledge, lack of skills necessary for the current technological edge and also lack confidence in the discharge of their responsibilities. This has compelled the industries to design several re-training programs in order for the graduates to be employable due to the poor quality of teaching they received from their various institutions of learning. Human resource development is the foundation of economic growth of any nation especially in the aspect of science and engineering for the main goal of industrialization and technological development.

Several studies conducted in Nigeria have questioned the relevance of graduates and research results in terms of industries, considering the lack of skill of

the graduates who have low academic status. This is attached to the wide gap created between the requirement of the industry and that of the society with the call for the re-structuring the curriculum to meet up with the requirements of the industry and the society (Olorunfemi and Ashaolu, 2008). The method of teaching in Nigerian institutions of learning is based on instincts with emphasis on memorization of ideas and insight and also with much more common features of theoretical approach. In developed countries, such as Britain, USA, Australia, Canada, Germany to mention but a few, multi-national companies usually partake in the training, curriculum development and even funding the institutions of learning, but in Nigeria, there is little or no input in educational sector from such multi-national co-operations.

For Nigeria to realize its goals in the NPE, it must set up and rehabilitate technical institutions, since the country is short of quality personnel in the sector (Oni, 2007). Uwaifo and Uwaifo (2009) stated that, the way teaching is conducted in TVE in Nigeria is not encouraging over the years. There is increasing concern by individuals, government and society over the preparation of TVE teachers in the country, since teachers play a very vital role in both the communities, schools and growth of the nation's economy, therefore the quality of teachers today indicates the behavior of its people tomorrow. Therefore, there is need to train the TVE teachers to gain knowledge and skills for the global and industrial challenges.

Uwaifo (2010) opined that, societal problems are supposed to be solved by technology in viable ways through adequate knowledge of TVE in terms of concepts and application of theoretical principles in order to solve pragmatic problems. This challenge has been facing Nigeria over many years and its inability to solve this task which has categorized the country as a low level nation in terms of technology and also classified as a developing nation. This is in connection with the attitude of government towards funding TVE schools which was not satisfactory and the nonchalant attitude given by government officials towards the program. This has caused for the stoppage of the program at various institutions of learning. The ill-equipped program has resulted in producing inadequately trained personnel and ill-equipped TVE graduates. Uwaifo further states that, the curriculum of TVE is established on foreign model which cannot be easily replicated in a developing

country as Nigeria. Dearth of competent supportive staff, lack of basic textbooks that could illustrate local examples for better understanding of the students and the overloading of the curricula which is more theoretical with purely science and mathematics contents in place of basic engineering and technology. The teaching techniques adopted by the teachers in imparting the knowledge are so traditional where teachers only read out for students to take notes.

Adebesin (2006) in his study on the in-depth review of the current state and focus of TVE in Nigeria shows that the educational system has kept on producing individuals who do not have occupational skills and attitudes for work than those that the nation needs to continue to be vibrant. However, the key policy speech of the former president Yar'Adua (late) revolves around his desire of changing Nigeria to be amongst the first 20th greatest world economies by the year 2020. For Nigeria to become renowned internally by the Nigerians and globally by other nations of the world to be amongst the largest economies of the world from Africa, government of the FRN and its agencies has the aspiration for the attainment of vision 2020 commonly referred to as economic buoyancy (Osifeso, 2011). Greater importance must be placed on TVE by the government for Nigeria's desire for the realization of vision 2020. The need for greater emphasis on TVE has been stressed by FRN (2004) in the NPE; but TVE program at all levels in Nigerian education system is faced with numerous problems and challenges. The problem of TVE especially METs at technical college level is summarized under the statement of the problem.

1.3 Statement of the Problem

Technical vocational education at the technical college level in Nigeria is designed to produce competent craftsmen for the various sectors of the economy who are expected to upon graduation to be able to be employed in the labor market. In spite of the importance of TVE to the growth of the individuals, the society and the nation at large, there is no emphasis placed on the effective implementation of TVE programs in Nigeria (Puyate, 2008). This situation according to Omotayo, *eta l.*, (2008) is as a result of inadequate funding, poor planning, inadequate facilities and

infrastructures, teachers incompetence, inconsistent monitoring and evaluation and poor material resources leading to problems militating against the implementation of technical college programs in Nigeria. The FRN in the NPE (FRN, 2004) stipulates that technical college graduates in Nigeria are expected to upon completion of their course to have acquired the practical skills to enable them to secure employment in industries or related organizations or be able to establish and become independent or to be gainfully employed by others.

The present industries are not really satisfied with the quality of TVE graduates in terms of employability and technical skills at the same time the graduates lack the technical competencies of being self-employed. The question that needs to be addressed with regards to whether the objectives of technical colleges are achieved for the purpose for which they are established, judging the fact that most graduates of technical colleges in Nigeria do not have the requisite skills that will make them to be employed or become self-employed. Olorunfemi and Ashaolu (2008) stated that, most of the industries in Nigeria have expressed their worry over the quality of METs graduates in terms of possessing low practical knowledge; lack of skills required for the present technological edge and also lack confidence in the performance of their responsibilities. As a result of this, there is a need to develop a conceptual model for effective implementation of METs program at the technical colleges to enable the students acquire both technical and employability skills to be able to realize the objectives of TVE as stipulated in NPE (FRN, 2004) so that METs graduates can secure jobs in the industries and other related organizations in Nigeria after the completion of their program.

1.4 Objectives of the Study

The main objective of this research is to:

- 1 Examine the teaching methods employed in the teaching of METs in technical colleges

- 2 Identify the level of competences of METs students in terms of employability skills.
- 3 Identify the level of competences of METs students in terms of technical skills.
- 4 Identify the challenges faced by METs teachers with respect to instructional delivery.
- 5 Determine the adequacy of infrastructural facilities for effective teaching and learning of METs program in technical colleges.
- 6 Determine the adequacy of workshop tools and equipment in METs program for effective skills acquisition in various METs.
- 7 Develop a conceptual model for effective implementation of METs program at the technical college level.

1.5 Research Questions

The following research questions were developed and utilized in carrying out the study from the main objective of the study.

1. What are the teaching methods employed in the teaching of METs in technical colleges?
 - (a). What are the teaching methods that influence the acquisition of employability skills?
 - (b) What are the teaching methods that influence the acquisition of technical skills?
2. What are the levels of competences of METs students in terms of employability skills?
3. What are the levels of competences of METs students in terms of technical skills?

4. What are the challenges faced by METs teachers with respect to instructional delivery?
5. How adequate are infrastructural facilities for effective teaching and learning of METs program in technical colleges?
6. How adequate are workshop tools and equipment in METs program for effective skills acquisition?
 - (a) How adequate are workshop tools and equipment in Motor Vehicle Mechanics (MVM) workshop for effective skills acquisition?
 - (b) How adequate are workshop tools and equipment in Welding and Fabrication Craft Practice (WFCP) workshop for effective skills acquisition?
 - (c) How adequate are workshop tools and equipment in Air Conditioning and Refrigeration (ACR) workshop for effective skills acquisition?
 - (d) How adequate are workshop tools and equipment in Mechanical Engineering Craft Practice (MECP) workshop for effective skills acquisition?

1.6 Research Hypotheses

The following null hypotheses guided the study and were formulated based on the research questions 1(a), (b), above and tested at 0.05 confidence level:

1. H_{0a} There is no significant difference in the teaching methods that influence the acquisition of employability skills of METs students
2. H_{0b} There is no significant difference in the teaching methods that influence the acquisition of technical skills of METs students

1.7 Significance of the Study

The importance of this study cannot be over-emphasized, For Nigeria's desired to realize her national goal through education, there is the need for the acquisition of the right skills, aptitudes and competence both mentally and physically as instrument for the individual to life and to also contribute to the advancement of the society, thus, no society can advance to a considerable extent without appropriate, efficient and technological based TVE. The country has come up with the national objectives of TVE which is supposed to be realized. This includes: acquisition of vocational and technical skills, making the students to be aware of various occupation by going through practical preferences in the labor market, allowing the youths develop an intellectual perception of the emerging complication of technology and arouse their creativity.

Therefore, it is hoped that:

1. The Federal and States Ministry of Education in Nigeria, will find the recommendations of the study useful by recruiting qualified teachers and instructors as well as updating the skills of those in service, purchasing the necessary tools and equipment that are necessary for skills acquisition of METs students in technical colleges.
2. Curriculum planners and policy makers in National Board for Technical Education (NBTE) will find the recommendations useful in planning and reviewing the curriculum content of METs program that will help in providing the right skills needed by the students for employment in industries or self-employment .
3. The findings from this research will be beneficial to METs teachers by identifying the employability skills as well as technical skills that are necessary for employment in industries.
4. The results of this research will be useful to the students in the sense that it will give the students insight and better understanding of the skills that are expected of them for self-employment and employment in the industries.

5. Society will also benefit from the study, as students acquire the right skills they will be gainfully employed, thus contributing to the improvement of the society and the country as a whole.
6. The study will be of significance to the industries (employers), as students acquire technical and employability and skills the industries employ productive work force who will contribute to the success and development of the organizations in which they are employed.

1.8 Conceptual Framework of the Study

The conceptual framework for this study is based on Context, Input, Process and Product (CIPP) model of evaluation, human capital theory and constructivism learning theory. The CIPP model of evaluation focuses on improvement oriented evaluation that is aimed at making decision towards a course or educational program (Darussalam, 2010). The CIPP model theory evaluation starts from evaluation of the context, input, process and finally the product. The conceptual framework of the study is illustrated in Figure 1.1

Context evaluation is concerned with whether the curriculum involves focused goals and objectives that has to do with the need of the industries and the society. It also judges the environs where the evaluation takes place that is the technical colleges in North Central States of Nigeria. The information and data gathered will serve as a basis for curriculum development and the objectives of the program (Stufflebeam, 1983). Therefore, context evaluation includes: policy, surroundings, needs assessment in terms of whether the aims and objectives of the program are in-line with the needs of the society and the industry (Tseng, *eta l.*, 2010).

Input evaluation involves the analysis of the resources and planned content of instruction (for instance the skills or approaches the learners use to learn), it relays with the determining the resources and approaches utilized to realize the aims and

objectives of the curriculum (Finch and Bjorkquist, 1977). Furthermore, the objective of input evaluation must assist in the choice of the resources. Thus, input evaluation should include at the least work plan, infrastructural facilities, workshop facilities, tools and equipment, teaching personnel and funding, these items will be utilized to review the curriculum design.

Process evaluation is concerned with the implementation of the program in terms of instructional delivery, utilization of facilities, workshop tools and equipment in order to realize the objectives of the METs in the technical colleges. The ultimate goals of process evaluation includes: to predict the mistake of plans; to give information for decisions making; and to ensure the process of plans. Utilization of process evaluation can provide frequent response to the program implementers and administrators. The researchers can know the initial plan, trace the process, find the change of plan, and present the material resources to ensure its efficiency and accomplishment (Wolansky , 1985; Finch and Bjorkquist, 1977).

Product evaluation is concerned with determining the outcome of the program in terms the graduates of the program acquiring both technical and employability skills (Kazilan *eta l.*, 2009; Clark, 2007). The rationale is to realize whether the instructional plan actually made a difference (Nicholson, 1989). Product evaluation is utilized to find out whether the program should be changed, adjusted, or stopped it could also be used to evaluate the output of program accomplishments. Based on the data associated to background, input, process, and product, it is concerned with the assessment of the difference between the outcomes and a set standard. It could provide the thorough explanation and consultation for decision-making. The conceptual framework of this study is illustrated in figure 1.1

Figure 1.1 Conceptual Framework

However, human capital theory, emphasized on the role of investment in education so as to improve economic and social achievements (Schultz,1963). Investment can be in terms of infrastructural facilities, workshop facilities, tools and equipment, teaching personnel (staff development), funding and so on, for the improvement of the quality of education. Education is a means of improving capability and aptitude. In addition, education provides a means to prepare, train,

discipline and reveals individuals skills and potentials. This means that education enhances productive work force among students in the form of human capital development. Human capital is also referred to as the practices that relays to training, education and other forms specialized programs in order to improve the levels of competences abilities, knowledge, values, skills, and social assets of the individual in order to be able to perform effectively at work (Marimuthu, *eta l.*, 2009). Erhuraa (Enyekit, *eta l.*, 2011) viewed human capital as an attempt to improve human skills, knowledge, productivity and encourage resourcefulness of the leaners through the process of education and training. The theoretical framework that is mostly accountable for the implementation of education and policies improvement is known as human capital theory.

Based on the work of Schultz (1963); Becker (1964); (Marimuthu, *eta l.*, 2009) human capital theory is based on the theory that education is greatly contributory and vital in the improvement of the production capacity of a populace. Becker (1962; 1964) expressed that the peak of the labor force production has a strong correlation with education and training, which implies that the higher the level of education and training individuals gets, the more the productive and the level of achievement of the person. This theory forms were the basic understanding on choosing the skills needed by employees or trainees where they will be able to identify the effects of the skill selection. Becker (1964) believed that education and training obtained through knowledge delivery and useful skills presentations would increase employees' productivity and at the same time lead to the higher incomes which can improve employees' life style. Apart from that, Becker also acknowledged that motivation and dedication in carrying out responsibilities are a worker's productivity whereas income becomes the motivation to work in a career. Human capital also determines individuals' or employees' income which is related to certain elements such as individuals who have higher education get jobs easily. Other than that, workers education and training has an important relationship with the level of production in the organization.

This research lays emphasis on the use of human capital theory in order to set up technical skills and employability skills required by current organizations and

industries. Human capital theory clarifies that the development of technical and employability skills would have a great impact on students who will enter the world of work immediately after graduation. The framework based on human capital theory emphasize on investment in education in terms of funding, infrastructural facilities, workshop facilities, tools and equipment, instructional materials, staff training to enhance the quality of instruction.

The conceptual framework of the study is also supported by learning theory of constructivism. The constructivism learning theory involves an active process, in which learners construct meaning by combining new knowledge with what they already have Jones and Brader-Araje.(Beyhan and Koksal, 2013). According to this theory, learners actively construct new knowledge by incorporating new information and experiences with what they have previously learned. The constructivism learning theory suggests a way to restructure the learning environment to make learning more effective and the belief that individual experiences are embedded to enable us to construct an understanding of the world we live in (Billet, 2001).

However, this study is concerned with the identification of the teaching methods that influences the acquisition of both technical and employability skills of METs students at technical college for effective implementation of METs program which will lead to better understanding of the phenomenon leading to the preparation of human capital for the service industries and other related organizations. There is a very strong relationship between the CIPP model of evaluation and human capital development theory identified in the conceptual framework of this study in the sense that the major thrust of human capital development is on the improvement of the quality of education for individuals to acquire knowledge, skills and competences to be able to perform effectively on the job. On the other hand CIPP model of evaluation is concerned with assessing the worth, value, adequacy efficiency and effectiveness of an educational program in order to provide information to decision makers to be able to make decisions that will improve the quality of an educational program. Human capital development theory also has a link with constructivism learning theory because human capital development is concerned with the providing conducive learning environment for training and education in which the learner will

be actively involved in order to create knowledge and solve problems educationally within the context of his environment based on his past experience.

1.9 Scope of the Study

The study is designed to develop a conceptual model effective implementation of METs program at technical college level in Nigeria, the study focused. METs teachers, administrators, students and master craft-men in service industries were utilized as respondents for the study using quantitative and qualitative approach. The study concentrated on the final year students in the following trades (motor vehicle mechanics, air-conditioning and refrigeration, welding and fabrication craft practice and mechanical engineering craft practice) in the technical colleges because of the number of years spent in the school which made them passed through all the modules designed for their various courses and they are ready to go into the labor market and also their level of experience in practical work and their participation in Students Industrial Work Experience Scheme (SIWES).

The study also focused on the teaching methods employed in the teaching of METs in the technical colleges, infrastructural facilities, instructional facilities, workshop facilities, tools and equipment for the students to use and acquire skills for self-employment and become economically empowered leading to national development and economic growth. The study shows the development of a conceptual model for technical and employability skills as an independent variable, teaching methods, infrastructural facilities, instructional facilities, workshops facilities tools and equipment as intervening variables while MET programs are the dependent variables. The focus of the study is on skills development in order to achieve greater productivity and employment growth.

1.10 Operational Definition of Terms

The followings are the operational definitions of terms that were used in the context of the research study.

1.10.1 Employability Skills

Employability skills are the types of skills that assist the individual to carry out his job efficiently and effectively in the workplace (Clarke, 2007). In the context of this research employability skills are the group of skills, knowledge and competence an individual is supposed to possess in order to secure maintain and perform effectively on the job. Employability skills are the types of skills that assist the individual to carry out his job efficiently and effectively in the workplace. It consists of communication skills teamwork skills, problem solving and decision making skills, initiative and enterprising skills planning and organization skills and information and communication technology skills.

1.10.2 Evaluation

Evaluation is defined as a systematic procedure of assessing the value, worth, desirability, effectiveness or efficiency of an educational program according to specific criteria and purpose (Uwaifo and Edigin, 2011). In-line with this research evaluation is referred to as a systematic process of judging the value or worth of course or program according to a particular criteria and purpose. Evaluation is an integral part of the instructional program and it offers basic information for a variety of educational decisions by determining whether the learner is progressing during the teaching learning process.

1.10.3 Human Capital Development

Human capital is referred to as the practices that relays with training, education and other specialized programs in order to improve the degree of competences, skills, knowledge, abilities, standards, and social assets of the individual in order to be able to perform effectively at work (Marimuthu,*eta l.*, 2009). Human capital development is concerned with training and education in order to improve the level of competences, skills, knowledge, abilities, and social resources of the individual to be able to perform effectively on the job.

1.10.4 Mechanical Engineering Trades

Mechanical Engineering Trades (METs) is a common term that is being utilized in defining trades that are having complete relationship with metal welding/forming and or servicing/repairs of machines or machine related equipment and appliances. The trades in this category consists of agricultural implement and equipment mechanic work, motor vehicle mechanics work, auto body repair and spray painting, auto electrical work, auto body building, auto parts merchandising, air-conditioning and refrigeration mechanics work, mechanical engineering craft practice, welding and fabrication engineering craft practice, foundry craft practice, instruments mechanics work and marine engineering craft (Peter, *eta l.*, 2010).

1.10.5 Technical and Vocational Education

Technical and Vocational Education (TVE) in the context of this research adopted the Federal Republic of Nigeria's definition in the National Policy on Education (FRN, 2004:30) as a "comprehensive term referring to those aspect of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes,

understanding and knowledge relating to occupations in sectors of the economic and social life”.

1.10.6 Technical College

Technical college in Nigeria is a training institute that provides education that is aimed at preparing students for employment into different vocations such as motor vehicle mechanics work, welding and fabrication work, air-conditioning and refrigeration work mechanical engineering craft practice to mention but a few.

1.10.7 Technical Skills

. In the context of this study, technical skills consists of the knowledge of methods, procedures, techniques and practices of carrying out a specialized task and the skills and competence to operate tools, equipment and machines that are related to that task.

1.11 Conclusion

It is a common knowledge that graduates of technical colleges cannot fit into the world of work without being re-trained. The employers of labor and the industry kept on complaining about the lack of graduates of technical college possession of technical and employability skills for the current technological edge and also lack confidence in the discharge of their responsibilities. Therefore, the research is designed to develop a conceptual model for effective implementation of METs program at technical college level in Nigeria. Specifically the study is aimed at identifying the levels of competences of METs students in terms of both technical and employability skills, examine the teaching methods employed in the teaching of METs, and determine the adequacy of infrastructural as well as workshop facilities.

1.12 Overview of the Thesis

The general outline of the study is arranged according to the followings chapters:

Chapter 1: The bases of this thesis such as background of the problem, statement of the problem, objectives of the study and research questions were discussed in this chapter. In addition, the chapter generally discussed on program evaluation, technical skills, employability skills and mechanical engineering trades. Furthermore, the significance of the study, scope of the study and conceptual framework of the study has been provided in order to support the rationale for carrying out this research. In the next chapter issues concerning program evaluation, employability and technical skills as well as different methods of instructions in TVE for effective teaching and learning etcetera were highlighted in details.

Chapter 2: The study aimed developing a conceptual model for effective implementation of METs program at technical college level in Nigeria. Related literatures from several authors all over the world were reviewed. Literatures from conference proceedings, journal publications, dictionary, research thesis, textbooks, newspapers publications and magazines were utilized as reference resources in order to review the literature for the research. Issues concerning educational system in Nigerian, structure of the Nigerian educational system, technical college education in Nigeria, program evaluation in TVE, human capital development theory, employability skills in TVE, technical skills in TVE, infrastructural facilities in TVE, workshop tools and equipment in TVE, industrial participation in TVE and teaching methods in TVE were highlighted in this chapter.

Chapter 3: This chapter presents the methods and procedures that were utilized for the current research study. In this chapter description of the design and procedure that was used by the researcher in carrying out the study were highlighted. The methods utilized in carrying out the study were discussed under the following sub-headings: research design, population of the study, sample and sampling procedure,

it also comprises of a comprehensive explanation of the research instruments that were utilized for data collection in the study. The procedure for testing the validity and reliability of the instruments were explained and the methods of data collection; the last part consist of a well- structured method of data analysis.

Chapter 4: Chapter four deals with the presentation and analysis of data for the research. The major objective for this chapter is to analyse the data collected in order to answer the research questions and the research hypotheses developed for the research. Generally, there are six (6) research questions that were answered in this research as stated in chapter one. The instrument that was utilized in the analysis of the quantitative data includes: descriptive and inferential statistics. The qualitative data were analyzed through a transcription process which is the process of transforming qualitative data from audio recording into typed text. The type text is called transcript and the transcription process involved listening to the taped recording and typing what was said into words. The transcripts were coded and categorized and analyzed through content analysis from which the findings of the research emerged.

Chapter 5: In this chapter, the summary, conclusion and recommendation of the study were presented. The chapter discussed in detail the research findings based on the research objectives stated in chapter one. The results of the research finding and the implications of the study was also be examined and compared with previous research works. Finally, the researcher presents discussions of findings, implications of the study, conclusion and the recommendations as a result of the findings from the research.

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