CHALLENGES OF TECHNOLOGY ADVANCEMENT IN WELDING AND FABRICATION IN TECHNICAL COLLEGES IN NIGER STATE

BY

JOHN JEROME

2007/1/27299BT

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

OCTOBER, 2012

TITLE PAGE

CHALLENGES OF TECHNOLOGY ADVANCEMENT IN WELDING AND FABRICATION IN TECHNICAL COLLEGES IN NIGER STATE

BY

JOHN JEEROME

2007/1/27299BT

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B. TECH) IN INDUSTRIAL AND TECHNOLOGY EDUCATION

OCTOBER, 2012

CERTIFICATION

I John Jerome Matric No: 2007/1/27299BT An undergraduate student of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other university.

---------- ----------

Name signature

APPROVAL PAGE

This project has been read and approved as meeting the requirement for the award of B. Tech degree in Industrial Technology and Education of the Industrial and Technology Education School of Science and Science Education Federal University of Technology Minna.

---------- ----------

Supervisor **sign date**

---------- ----------

HOD **sign date**

---------- ----------

External Examiner **sign date**

DEDICATION

This project is dedicated to the everlasting Memory of my late parents,

Papa John Adeeyo, Mama Margret Adeeyo. A mother that surpasses other mothers and in memory of my beloved sister Bosede Adeeyo

With everlasting thanks for everlasting Father, Son and Holy Spirit.

ACKNOLEDGEMENT

I wish to acknowledge my project supervisor Mal. Bala Maik Mohammed, for his patience in reading through my manuscripts and making valuable corrections and suggestion. Also my profound gratitude goes to Prof. G.D Momoh, and Dr. E.J Ohize for they are the genesis of this study and their fatherly support.

Also to all the lecturer in the department of Industrial and Technology Education for their support and guidance

Many thanks go to my family members, John Abu, John Niyi, John Paul, John Afolabi and my lovely sweet sisters. John Jummai Theresa and John Mary, Franca, Emmanuela and kizzy boy, you are my happiness.

My gratitude to my leader Charlse Victor,

Lastly to my friends especially Gotau Yakubu, Olukayode Adebayo, Emmanuel Owezie, Moses Jolayemi, Ahmmed Abdulazeez, Adebayo Jorda, Philip Adama, Shiela Kassang Adams, Beauty Inyang, Jamiu Adeniji, Anayo Ngwaka and my school daughter Hanna Nissi.

Also may I use this medium to appreciate all my fellow Comrades and Bongo friends?

I love you all and my gratitude is really immense.

All, to the glory of God, the beginning and the ending

ALUTA CONTINUA!

VICTORIA ACERTA!!

TABLE OF CONTENTS

CHAPTER 2

REVIEW OF RELATED LITERATURE

Concept of Technology advancement

Challenges in technology development

Developmental trends in welding and fabrication

Technological advancements in welding and fabrication

Welding and fabrication curriculum in technical colleges

Technical colleges in Niger state

CHAPTER 3

METHODOLOGY

Research design

Area of study

Population

Sampling techniques and sample size

Research Instrument

Methods of data collection

Methods of data analysis

CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

Research question1

Research question 11

Research question 111

CHAPTER 5

SUMMARY CONCLUSIONS AND RECOMMENDATION

Summary of the study

Implication of the study

Conclusions

Recommendations

Suggestions for further research

References

ABSTRACT

This study was designed to identify the challenges of technology advancement in welding and fabrication in technical colleges in Niger state. The purpose of the study was to find out the challenges of teaching and learning modern techniques of welding and fabrication in technical colleges. A review of literature was carried out on technological advancement in welding and fabrication. Four research questions were formulated to guide the study, and the research was restricted to cover the area of welding and fabrication, therefore questionnaire items for the instrument were drawn based on the activities in welding and fabrication, forty eight (48) people responded (which comprises of both teachers and students) in the seven (7) in technical colleges in Niger state; the data obtained was analyzed using table, frequency percentages and charts. The result of the findings revealed that there qualified teaching and technical personnel in welding and fabrication. It was also revealed that there are on modern equipment for teaching and learning welding and fabrication.

Further mine, from the response from the respondents it was discovered that that the major problems facing technical colleges in Niger state are; inadequate funding, lack of training and retraining of staff, and bad management policy. It was recommended that metal work teachers should be given orientation via seminars, training, scientific exhibitions and workshops. It was also recommended that Niger state Science and Technical Board should intensify efforts to adopt a quarterly performance review and assessment supervision policy. Furthermore, it was recommended that government should provide technical colleges with enough funds to ensure conducive, serene and qualitative learning environments.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Welding and fabrication are some of the most common and dependable methods of joining materials together. Fabrication is the process of blueprint reading, layout, cutting and preparing materials for assembly while welding is the joining of two components by a coalescence of the surfaces in contact with each other. This coalescence can be achieved by melting the two parts together – fusion welding – or by bringing the two parts together under pressure, perhaps with the application of heat, to form a metallic bond across the interface. This is known as solid joining.

According to Howard (1998), welding can trace its historic development back to ancient times. The earliest examples come from the Bronze Age. Small gold circular boxes were made by pressure welding lap joints together. It is estimated that these boxes were made more than 2000 years ago. During the Iron Age the Egyptians and people in the eastern Mediterranean area learned to weld pieces of iron together. Many tools were found which were made approximately 1000 B.C.

During the middle Ages, the art of blacksmithing was developed and many items of iron were produced which were welded by hammering. It was not until the 19th century that welding, as we know it today was invented.

Major advances were made in welding technology, which including the introduction of automatic welding in 1920, in which electrode wire was fed continuously. The field of welding continues to evolve, with significant advancements in technology.

Welders can specialize in an exciting variety of disciplines, including robotics and other automated systems, nanotechnology, pipefitting, alternative energy applications, infrastructure fabrication, underwater welding,

The challenges pose by the advancement of technology in welding and fabrication in technical colleges in Niger state which of course is our topic, needed to be dealt with in a more pragmatic approach this project considering many technological factors that had evolved over the years and relating it to our local environment or area of study that is the technical colleges in Niger state, It has come to a point where many technical students abandon their field of study because of problems related to in adequate equipment and less sophisticated and qualified manpower to compete with global technological advancement in welding and fabrication.

Many countries around the globe are now concerned with developing and improving their technical expertise through a suitable national education policy. The situation of Nigeria is not different. In fact, it could be said that Nigeria is now desperate in her bid to change her status from that of an underdeveloped to a developed economy.To achieve this stride, Nigeria has in place an enabling education policy of 6-3-3-4 with the particular mandate of effecting the change in Nigeria's economic status.

Besides the above effort, the Government also permitted the creation of Technical Colleges. The National Board for Technical Education (N.B.T.E) stated that there are at present 110 approved tertiary technical institutions and 159 technical colleges in Nigeria. Out of these, Niger state accounts for seven (7) technical colleges with technical options

comprising of Metalwork, woodwork, Building Technology, Auto Mechanic and Electrical / Electronic study at their basic level. Metalwork technology is among the engineering trades in technical education as stated in the National Board for Technical Education (N.B.T.C). Curriculum with the following objectives:

- To produce skilled sheet metalworker, who has good knowledge of the use and application of sheet metal working equipment, materials, process, techniques and safety practices?
- To equip the trainee with the knowledge and skill to carry out gas welding and cutting job on all types of metals.
- To equip the trainee with the knowledge and skill to carry out metal or welding and cutting job involving various ferrous and non-ferrous metal in all position.
- To provide the trainee with the knowledge and skill to enable him produce simple finished structural sheet metalwork project with safety.

Technical Education (TE) is the aspect of Education that prepares people academically to be engaged in the acquisition and application of science and modern technology by focusing both on the theoretical and practical application of basic scientific principles. Nigeria's National Policy on Education (N.P.E) defines Technical Education, as "that aspect of Education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge". Momoh (2005) succinctly states that Technical Education is not a general education.

Furthermore, Jean (2003) stated that Technical Education designates the aspects of the technical process which in addition to a general instruction, imply the study of a closely related science and the acquisition of practical capacities, attitudes, understanding and knowledge related to trades of a different section of economic and social life. It is not necessarily "Vocational" in the sense of preparing directly for the exercise of a trade or job. This teaching can be part of a study programme in progress with the purpose of graduating to a higher level of studies.

The above quotation brings out the claim that Technical Education is not necessarily vocational as this seems to be the situation in Nigeria sometimes. Conversely, both Technical and Vocational Education are closely related as one leads to the other.

Since the knowledge of welding and fabrication is obtainable through formal educational system and through apprenticeship, it is nonetheless expected that technical colleges should equip her students with knowledge of technological advancements that will transcend the knowledge base of the local apprentice.

According to Mohammed (2005), the problems of Technical and Vocational Education in Nigeria ranges from low manpower (teacher/students), inadequate infrastructure and equipment, lack of motivation, inadequate technical knowledge etc. All these problems by implication are common to welding and fabrication being one of the trades in technical colleges.

The choice of welding and fabrication as a project study is due to its vast opportunity for the present and the future. Mindful of the enormous prospects that are

opened to Nigerians due to technological advancement in welding and fabrication; and in consideration of the fact stated by Mohammed (2005), that such expertise are not well transmitted in our schools and colleges, the researcher hereby conduct this study to determine the challenges in the technical colleges that are influenced by technological advancement.

One of the objective of vocational/technical education in Nigeria was the production of skilled, self-reliance and enterprising craftsmen and technicians who can apply their knowledge and vocational skills necessary for solving industrial, agricultural and economic problem of the nation (N.P.E, 2004) part of the effort towards achieving these objectives is the establishment or introduction of National Technical Certification (N.T.C) and advance National Technical Certificate (A.N.T.C) programmes in the school system at technical colleges level. Technical education is planned for the purpose of developing basic manipulative skills, safe judgment, technical knowledge and related occupational information for the purpose of fitting young person for employment in industrial occupations.

Statement of the Problem

In Nigeria, technical colleges are the foundation for the inoculation of basic Technical and Vocational knowledge that ought to produce not just self-reliant graduates, but those that will evidently boost the application of technological advancements in the country. However, technical colleges are far from acquiring the capability of adequately

harnessing and utilizing the already existing technologies, needless thinking of them creating new ones.

The low admission of students into welding and fabrication programmes in universities, polytechnics and college of education technology and a fewer number of welding and fabricators in our community today are indications of non achievement of the objectives of technical education that relates to welding and fabrication trade. This study will identify the challenges of welding and fabrication influenced by the technological advancement in technical colleges in Niger state.

Purpose of the Study

The general purpose of this study is to find out the challenges of teaching and learning modern techniques of welding and fabrication in our technical colleges.

Specifically, the study will:

- Identify the availability of qualified teaching and technical personnel in the field of welding and fabrication in technical colleges.
- Assess the availability and adequacy of modern equipments for the teaching and learning of welding and fabrication using the available equipments.
- Identify problems associated with technological advancement in welding and determine the adequacy of materials and supplies for workshop practices in technical colleges in Niger state.
- Derive ways of solving the identified problems.

Significance of the Study

The findings of the study will contribute to the advancement of metal works in general and welding/fabrication in particular. It is hoped to provide:

- Exposure to prospective students of technical colleges in that the research tend to identify the availability of qualified teaching and technical personnel in the field of welding and fabrication in technical colleges. This shall assist them in making a choice to consider the trade in their future endeavor.
- Students of technical colleges shall gain from this project as it shall give them a better understanding of welding and fabrication as a trade with diverse potentials. This knowledge shall be derived from the review of literature on the trade of welding and fabrication.
- This research shall assess the availability and adequacy of modern equipments for the teaching and learning of welding and fabrication. This assessment, coupled with the determination of the effectiveness of laboratory activities in technical colleges shall be beneficial to the teachers who will utilize the assessment to improve the teaching experience within the field.
- Last but not the least, the National Board for Technical Education (NBTE) could adopt the recommendations contained herein to identify and proffer solutions to the challenges of welding and fabrication influenced by the technological advancement in technical colleges.

Scope of the Study

The study is restricted to the assessment of some staff and students in the technical colleges in Niger state who are the respondents that participated in the survey. This will involve the determination of the challenges of welding and fabrication influenced by the technological advancement in technical colleges. The study shall thus identify the modern trends of welding and fabrication in line with the curriculum and the Nigeria's National Policy on Education (NPE).

Research Questions

- Are there qualified teaching and technical personnel in welding and fabrication in technical colleges?
- Are there adequate modern equipment for the teaching and learning of welding and fabrication in technical colleges?
- What are the problems of using modern equipment for teaching skills in welding and fabrication?
- Are there adequate materials and supplies for workshop practices in technical colleges in Niger state?

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter reviewed some of the related literatures under the following headings:

- Concept of Technology advancement
- Challenges in technology development
- Developmental trends in welding and fabrication
- Technological advancements in welding and fabrication
- Welding and fabrication curriculum in technical colleges
- Technical colleges in Niger state

Concept of technology advancement

Technology is the making, modification, usage, and knowledge of tools, machines, techniques, crafts, system, methods of organization, in order to solve a problem, improving a preexisting solution to a problem, achieve a goal or perform a specific function. It can also refer to the collection of such tools, machinery, modification, arrangement and procedure. Technologies significantly affect humans as well as other animal species' ability to control and adapt to their natural environments. The word technology comes from Greek '*technologia'*; from '*techne'* meaning "art, skill, craft" and *'logia'* meaning "study of-". (Merriam-Webster, 2007).

The term can either be applied generally or to specific areas: examples include construction technology, medical technology and information technology.

Advancement on the other hand, is an act of moving forward. (Dictionary.com, 2012)

"Technological advancement means the generation of information or the discovery of technical knowledge that advances the understanding of the underlying technologies. Seeking a technological advancement means attempting to increase the technology base or level of the company from where it was at the beginning of a systematic investigation or search by experience or analysis." (CRA Clickable Form T661 (08) – Glossary)

The advancement of technology has remarkably improved the quality of life. In contemporary history, every appearance of a new technology has improved the social advancement, enhancing the quality of life. The invention of the car and the plane made it possible for people to travel far away from their home for vacation and business. The updated technology to cars and planes makes peoples travel more comfortable and safe. People can take advantage of the big ship for a cruise and the ship provides people with the products of all over the world. The appearance of the electricity brought people to a completely new world. The domestic appliances help people economize time on homework so that people have more time for relaxation. The TV and Internet provide people the entertainment as well as the information. The people benefited a lot from the development in medicine. A lot of incurable diseases become no more deadly. The average of people's life now increases a lot than before.

The technology is also stimulant to the economic prosperity. Economic prosperity contributes to create more employment opportunity in job market. The increase in employment opportunity can help resolve the social problems, such as violence, drug,

poverty, etc. These social problems are main factors undermining the quality of people's life. The violence makes people worried about their safety. The poverty can only give people misery, never mind the quality of life. Only can a rich and developed society guarantee the quality of peoples' life. It is impossible for us to expect a high quality of life in a poor society with low productivity and undeveloped technology.

Although the technology creates some problems threatening the quality of people's life, these problems will not be a threat any longer if we use the technology well. Meanwhile, I believe the threat or the damage will be overcome following the further technological development. (Mandal, 2002)

Challenges in technology development

Barriers and challenges: A number of barriers stand in the way of mainstream adoption of personal manufacturing technologies that discourage widespread home, school and business use. A chief barrier is the "chicken and egg" paradox, where today's current consumer and education markets for personal fabrication technologies is too small to attract the attention of companies, discouraging company investment in creating products and services, hence failing to attract more consumers. Other barriers are safety concerns, part standardization and version control challenges, intellectual

Property issues and a lack of appropriate safety and regulatory controls. (Reynolds, 2004)

Technological Advancements in Welding and Fabrication

There were several advancements in the welding industry during the 1960's. Dualshield welding, Innershield, and Electroslag welding were some of the important welding developments of the decade. Plasma arc welding was also invented by Gage during this time. It was used for metal spraying. The French also developed electron beam welding, which is still used by the aircraft manufacturing industries of the United States. (Go Welding.org, 2012)

Some of the recent developments in the welding industry include the friction welding process developed in Russia, and laser welding. Laser was originally developed in Bell Telephone Laboratories but it is now being used for various kinds of welding work. This is due to the inherent capacity of lasers in rendering precision to all kinds of welding jobs. (Go Welding.org, 2012)

Also, in recent years, in order to minimize labor costs in high production manufacturing, industrial welding has become increasingly more automated, most notably with the use of robots in resistance spot welding (especially in the automotive industry) and in arc welding. In robot welding, mechanized devices both hold the material and perform the weld (Lincoln Electric, p. 4.5-1) and at first, spot welding was its most common application, but robotic arc welding increases in popularity as technology advances. Other key areas of research and development include the welding of dissimilar materials (such as steel and aluminum, for example) and new welding

processes, such as friction stir, magnetic pulse, conductive heat seam, and laser-hybrid welding. Furthermore, progress is desired in making more specialized methods like laser beam welding practical for more applications, such as in the aerospace and automotive industries. Researchers also hope to better understand the often unpredictable properties of welds, especially microstructure, residual stresses, and a weld's tendency to crack or deform. (ASM, pp. 995–1005)

The trend of accelerating the speed at which welds are performed in the steel erection industry comes at a risk to the integrity of the connection. Without proper fusion to the base materials provided by sufficient arc time on the weld, a project inspector cannot ensure the effective diameter of the puddle weld therefore he or she cannot guarantee the published load capacities unless they witness the actual installation. (Snow & Easterling, 2008) This method of puddle welding is common in the United States and Canada for attaching steel sheets to bar joist and structural steel members. Regional agencies are responsible for ensuring the proper installation of puddle welding on steel construction sites. Currently there is no standard or weld procedure which can ensure the published holding capacity of any un-witnessed connection, but this is under review by the American Welding Society.

Developmental trends in welding

There are many different types of welding process in the welding history. The term welding, whose origin is identical with that of the word well in the sense of welling

or boiling up? In the previous time known to have been familiar to some extent with the blowpipe or flame torch, but there was no record of their having ever applied it to the joining of metal by fusion process. The water-gas welding process was applied in the end of 19th century. The flame which is produced from water-gas replaced the blacksmith s hearth as a mean of heating the metal and welded the metal but this is first welding. Another type of welding is the more modern types the termed cast-welding. In this method the molten metal pouring into a mould which has runner at the point where the casting had failed to flow or wherever there was a fractured place. The molten iron poured in until it was fluid everywhere around the edge of the job and runner was stopped up, and then the iron was allowed to cold in the mould. This welding process can be said modern fusion weld process, but this is slightly high cost process than other types of welding.

At that time the oxy-acetylene welding process discovering was the most vital importance invention in the welding history. That awardable invention gone to Mr. Edmund Davy in 1836, this type of welding discovery was known to chemists a long time before it became a factor of economic importance to the world.

Willson and Moisson (1891) had developed a method of making calcium carbide (CaC_2). In 1895 a Frenchman had discovered the type of welding process that equal parts of acetylene and oxygen burned together gave a higher temperature.

Another welding had been happening in (1881) by Meritens. During his experimental works he faced with the necessity of joining together certain parts of

electrical storage batteries. He placed the work-piece on a table and it connected with the positive pole of the source of current, the other pole connected a carbon rod which has kept on operator hand. Then he strike on the work, at that time first produced an arc and some heat was generated. Finally he made a fused the metallic lead of battery plate. The first job lead container which was used for some chemical container was produced with this type of arc welding process.

Elihu Thomson had made first electric welding machine patent in the year of 1886, which was big type of welding machine. His process was usually called butt-joint welding. He had also modified the other welding system later because the jaw which was used for griping the job the piece got too much hot. So he developed water cooled jaw system.

Other recent developments in welding include the 1958 breakthrough of electron beam welding, making deep and narrow welding possible through the concentrated heat source. Following the invention of the laser in 1960, laser beam welding debuted several decades later, and has proved to be especially useful in high-speed, automated welding. Electromagnetic pulse welding is industrially used since 1967. Friction stir welding was invented in 1991 by Wayne Thomas at The Welding Institute (TWI, UK) and found high-quality applications all over the world. (Schwartz, 2011) All of these four new processes continue to be quite expensive due the high cost of the necessary equipment, and this has limited their applications. (Lincoln Electric, pp. 1.1–10)

Developmental trends in fabrication

It is a generally accepted belief that metal was discovered before people began to write and was first used to make tools and weapons such as arrowheads. Metal fabrication process and techniques are also scientifically referred to as metallurgy (ehow.com, 2012).

By the historical periods of the Pharaohs in Egypt, the Vedic Kings in India, the Tribes of Israel, and the Maya civilization in North America, among other ancient populations, precious metals began to have value attached to them, in some cases rules for ownership, distribution, and trade were created, enforced, and agreed upon by the respective peoples. By the above periods metalworkers were very skilled at creating objects of adornment, religious artifacts, and/or alloys. These skills were finely honed and well executed. The techniques were practiced by artisans, blacksmiths, a tharvavedic practitioner, alchemists, and other categories of metalworkers around the globe. For example, the ancient technique of granulation is found around the world in numerous ancient cultures before the historic record shows people traveled seas or overland to far regions of the earth to share this process that still being used by metal smiths today.

As time progressed metal objects became more common, and ever more complex. The need to further acquire and work metals grew in importance. Skills related to extracting metal ores from the earth began to evolve, and metal smiths became more knowledgeable. Metal smiths became important members of society. Fates and economies of entire civilizations were greatly affected by the availability of metals and

metal smiths. The metalworker depends on the extraction of precious metals to make jewelry, build more efficient electronics, and for industrial and technological applications from construction to shipping containers to rail, and air transport. Without metals, goods and services would cease to move around the globe on the scale we know today.

More individuals than ever before are learning metalworking as a creative outlet in the forms of jewelry making, hobby restoration of aircraft and cars, blacksmithing, tinsmithing, tinkering, and in other art and craft pursuits. Trade schools continue to teach welding in all of its forms, and there is a proliferation of schools of Lapidary and Jewelers arts and sciences at this, the beginning of the 21st century AD.

Welding and fabrication curriculum in technical colleges

The main aim of the above curriculum is to attain the objectives of the National Policy of Education by providing training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.

ENTRY QUALIFICATIONS

Craft Programme: Candidates must not be less than 14 years of age and should have successfully completed three years of Junior Secondary education or its equivalent.

Special consideration may be given to sponsored candidates with lower academic qualifications who hold trade test certificates and are capable of benefiting from the programme.

Technical colleges in Niger state

The following are the technical colleges in Niger state which offer welding and fabrication:

Government Technical College Minna,

Government Technical College Iyagi Bida,

Government Technical College New Bussa,

Government Technical College Kontagoro,

Suleiman Barau Technical College Suleja,

Federal Science Technical College Kuta,

Government Technical College, Pandogari

CHAPTER THREE

RESEARCH METHODOLOGY

Research Design

The design of this research is a survey of Technical Colleges in Niger state using questionnaires to capture data from teachers and students of metalwork. The reason for employing this design is due to the fact that the researcher needed to cover seven technical colleges in a systematic manner thus survey becomes most appropriate. The adoption of survey for any research is aim at collecting data on the characteristic, features or fact about the given population. The use of questionnaire, helped to obtain data on the perceptions of teachers and students of metalwork as it relates to the challenges of welding and fabrication in technical colleges that are influenced by technology advancement.

Area of Study

This study covered all the seven Technical Colleges offering metal or welding and fabrication technology in Niger State. The Technical Colleges are located in Kuta, Suleja, Minna, Bida, New- Bussa, Kontagora, and Pondogari.

Population

The research population covered teachers and students of metalwork technology in the seven technical colleges in Niger state. A total of One hundred and forty respondents

made-up the research population out of which twenty eight (28) were teachers and one hundred and twelve (112) were students.

Sampling techniques and sample size

The researcher took a sample of ten (10) respondents from each institution. Subsequently, the researcher administered the questionnaire randomly to the respondents who are members of the population sample in each of the institution. Afterwards, the researcher was able to draw data from forty eight respondents (twelve (12) teachers and thirty six (36) students) within the research population sample.

Research Instrument

The research instrument used is a short structured questionnaire meant to draw data that will aid the researcher to determine the level of the challenges of technological advancement in welding and fabrication in technical colleges in Niger State. The instrument was divided into two sections namely sections A and B. Questions were accompanied by multiple choice option that the respondent is expected to select from by ticking the right answers. The distribution of the sections is as follows:

Section A: This was used to collect the respondent's bio data

Section B: The section was however used to answer the research questions.

Administration of the Instrument

The questionnaire for this study was administered to the respondents by the researcher. The principal of the colleges under the area of study were approached for assistance, to enhance co-operation of respondents and ensure high return rate of the instrument, information regarding the nature and purpose of the study were provided. The presentation of how the researcher distributed the questionnaire and statistics of the number that returned is as follows:

Technical College	No. Distributed	No. Returned	% Returned
GTC, Minna,	10	9	90%
GTC, Bida	10	10	100%
GTC, Suleja	10	7	70%
FSTC, Kuta	10	10	100%
GTC, Pandogari	10	5	50%
GTC, Kontagora	10	7	70%
GTC, New Bussa	10	0	0%
Total	70	48	

Methods of data collection

The researcher distributed questionnaire to teachers and students on the respondent to truthfully provide answer the questions contained therein. The answers served as data for the analysis.

Methods of data analysis

The study employed descriptive statistics to analyze the data obtained. Data were analyzed using a statistical tool (frequency distribution table and the modal frequency, most popular opinion) of each group of responses received was adopted as the determinant of the finding. Table of percentages and chart were used to present a visual interpretation of responses while the discussions followed immediately.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

This chapter presented the data collected that were collectively analysed in relation to the total number of questionnaires that the respondents returned to the researcher. The presentation of how the researcher distributed the questionnaire and the statistics of the number that returned is as follows:

PRESENTATION AND ANALYSIS OF RESPONDENT`S ANSWERS TO THE RESEARCH QUESTIONS

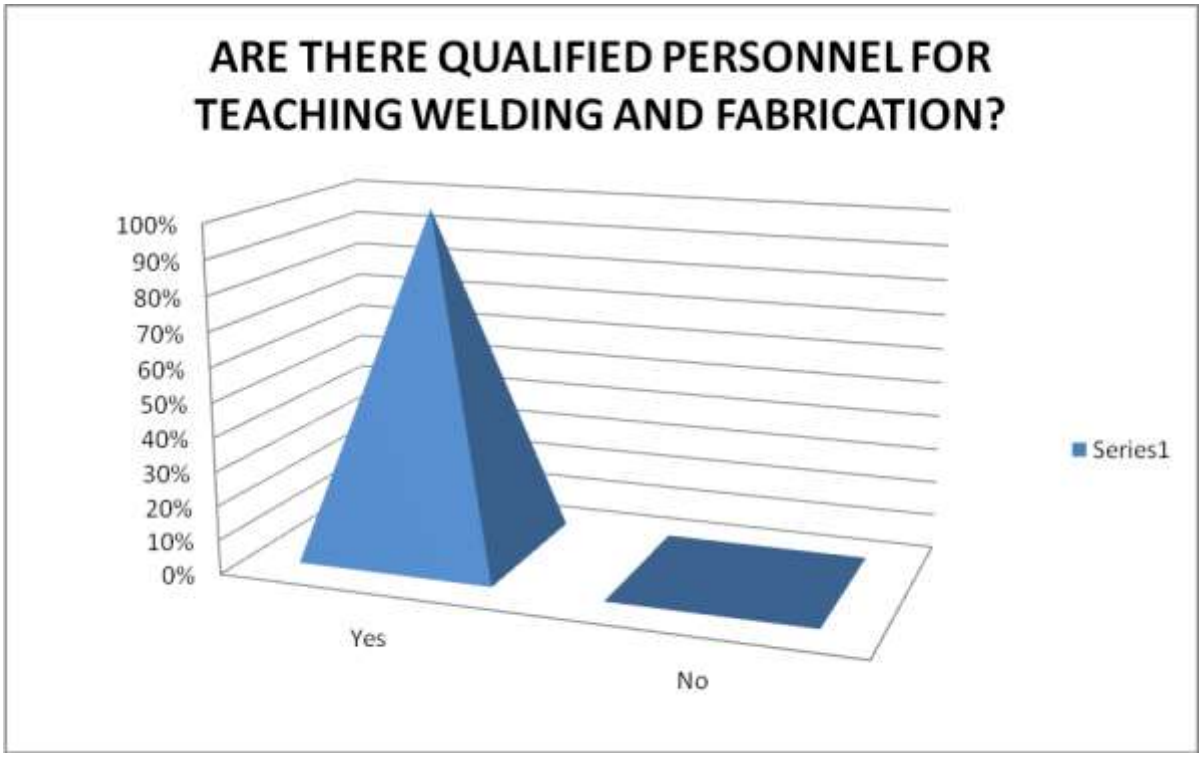
Presentation of research question No. 1

1. Are there qualified teaching and technical personnel in welding and fabrication in technical colleges? Please tick as applicable

Responses	Tally	frequency	percentage
Yes	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |||	**48**	**100**
No	**-**	**-**	**-**

The table above reveals that there were 48 respondents (i.e100%) and they all responded agreed to the fact that there are qualified teaching and technical personnel in welding and fabrication in technical colleges.

Chart 1

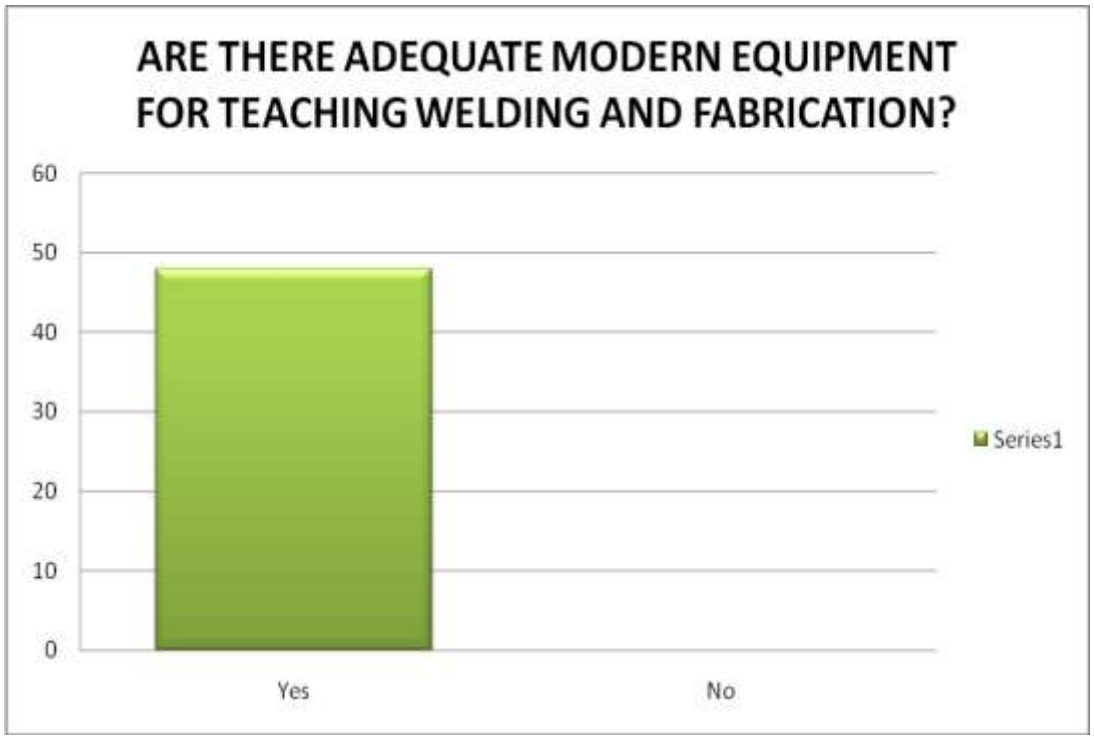


2. Are there adequate modern equipment for the teaching and learning of welding and fabrication in technical colleges?

Responses	Tally	frequency	percentage
No	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |||	**48**	**100**
Yes	**-**	**-**	**-**

This table also revealed that the 48 respondents responded No, which means that there are no adequate modern equipment for the teaching and learning of welding and fabrication in technical colleges.

Chart 2



3. What are the problems of using modern equipment for teaching skills in welding and fabrication?

   The question allowed the respondents to present multiple options as the problem of teaching welding and fabrication using modern equipment. It was therefore possible for all options A-D to be adopted as the problem by

every respondent. The frequency distribution table below present respondent's answers as follows:

Responses	Tally	frequency	Percentage
A. Lack of technical know-how	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||	32	66.6%
B. Inadequate funding	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |||	48	100%
C. Lack of training and retraining of staff	𝍸 𝍸	10	20.8%
D. Bad management policy	𝍸 |||	8	16.6%
E. I don't Know	-	-	-

From the table above it was observed that 66.6% of the respondents believes that Lack of technical know-how is a problem while all the respondents selected inadequate funding as the problem. Meanwhile 10 respondents representing 20.8% of the sample population selected lack of training and retraining of staff as the major problem. The researcher hereby avers that inadequate funding and lack of technical know-how are the major problems of using modern equipment for teaching skills in welding and

fabrication. Lack of training and retraining is also a problem and the least which is 16.6% of the total respondents adopted bad management policy as problem.

Th chat below provides a visual impact of the reaction of respondents concerning the problems of using modern equipments for teaching in welding and fabrication.

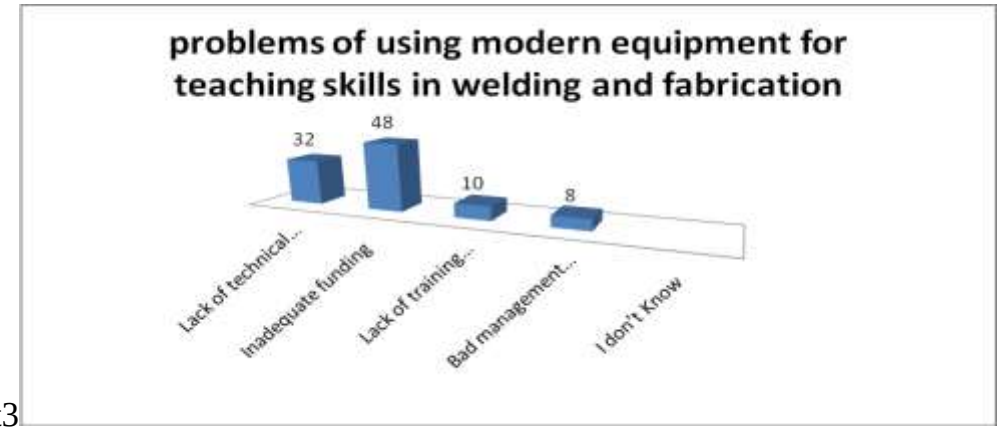


Chart3

4. Are there adequate materials and supplies for workshop practices in technical colleges in Niger state? (Please Tick [√] as appropriate).

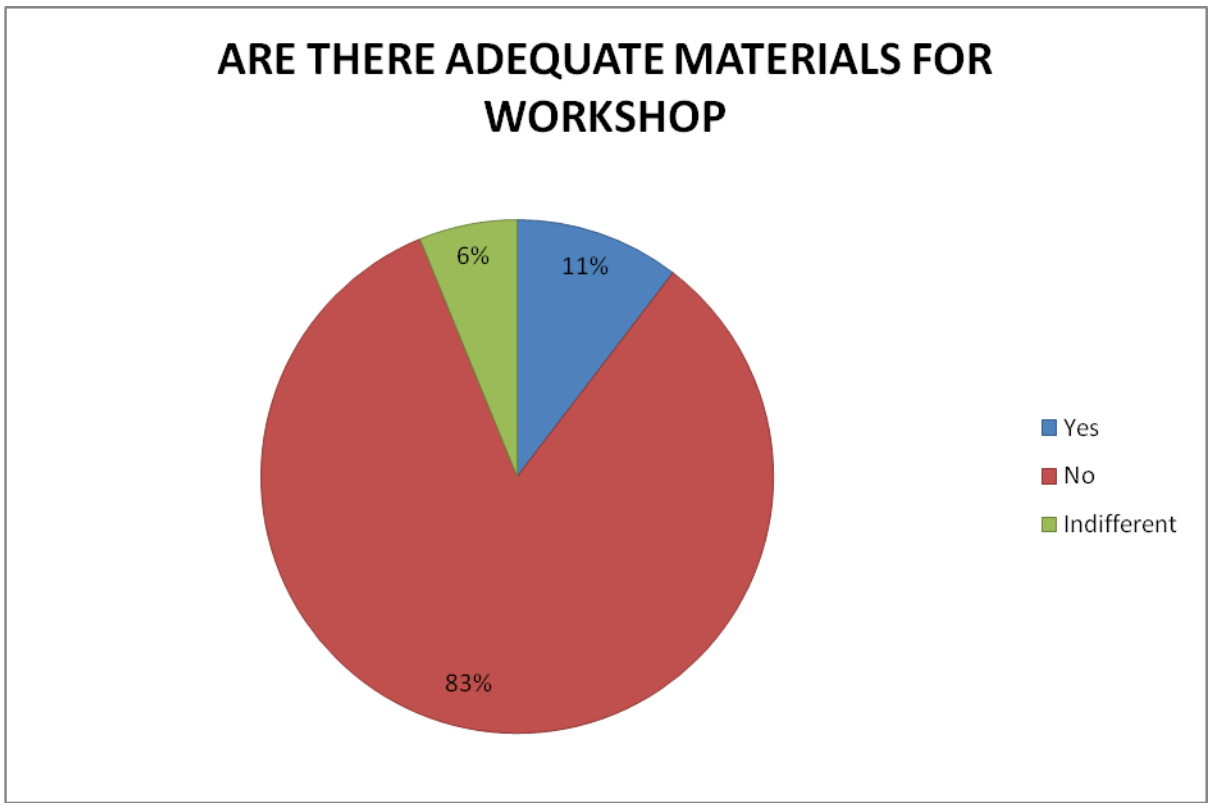
   Yes [ ] **No [ ]** Indifferent **[ ]**

Responses	**Tally**	**frequency**	**percentage**
Yes	𝍸	**5**	**10.4%**
No	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	**40**	**83.4%**
Indifferent	|||	**3**	**6.2%**

The table above indicates that 5 respondent agreed (which is equivalent to10.4% of the research population) that there are adequate materials and supplies for

workshop practice and 40 respondents disagreed (i.e 83.4% of the research population), 3 respondents were indifferent (i.e 6.2%).

Chart 4



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter deals with the summary of the study, the recommendations based on the findings, and the conclusions drawn from the study. The implications of the study and suggestions for further research are also stated.

Summary of the study

The purpose of the study was to find out the challenges of teaching and learning modern techniques of welding and fabrication in our technical colleges. The findings of the research is hoped to uplift the standards of technical education, metal work technology and breed capable or competent students when it comes welding and fabrication.

As a result of the aforementioned general purpose and findings of this research, four research questions were formulated. These include:

i. Are there qualified teaching and technical personnel in welding and fabrication in technical colleges?
ii. Are there adequate modern equipment for the teaching and learning of welding and fabrication in technical colleges?

iii. What are the problems of using modern equipment for teaching skills in welding and fabrication?

iv. Are there adequate materials and supplies for workshop practices in technical colleges in Niger state?

The research was delimited to cover the area of fabrication and welding. Questionnaire items for the instrument were drawn based on the activities in fabrication and welding. The seven (7) technical colleges used for the study are:

1. Government Technical College Minna, Niger State
2. Government Technical College Iyagi Bida
3. Government Technical College New Bussa, Niger State
4. Government Technical College Kontagoro, Niger State
5. Suleiman Barau Technical College Suleja, Niger State
6. Federal Science Technical College Kuta, Niger State
7. Government Technical College, Pandogari

A total number of respondents were forty eight (48) both teachers and students. All administered questionnaire were collected and analysed.

Critical analysis shows that the whole respondents agreed that there are qualified teaching and technical personnel in welding and fabrication. They also agree that there no modern equipment for teaching and learning of welding and fabrication. The response from the respondents shows that the major problem most technical

colleges are facing are as follows: lack of technical know-how, inadequate funding, lack of training and retraining of staff, and bad management policy. The researcher discovered that there are no adequate materials and supplies for work shop practices in technical colleges.

Implications of the study

The findings of the study had implications for the continuous existence, upliftment and standards of technical colleges in Nigeria and its products. The outcomes of assessment with this instrument enable the management and staff of technical colleges to easily identify and subsequently remind the students and teachers of their area of weakness and possible ways of improvement in future.

Conclusions

Based on the findings of the study, the following conclusions were drawn:

1. It was discovered that the challenges facing technical colleges in Niger-State are enormous and needs pragmatic approach towards finding solutions to these challenges and further promotes innovation in welding and fabrication. This will enable technical colleges in Nigeria to be attuned with current welding and fabrication practices in the 21st century.

Government need to provide adequate funds for technical colleges to enable them purchase modern equipment and train teachers and students to be practically oriented.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Metalwork technology teachers should be given orientation through organizing seminars, trainings, scientific exhibitions and workshops on the need to identify problems associated with technological advancement and proffer solutions to problems affecting welding and fabrication in technical colleges. The Management of technical colleges should encourage students, by organizing scientific debates and students fair to motivate students to be innovative and technologically inclined.

2. The Science and technical board in Niger state should intensify effort to adopt this identified performance objectives quarterly assessment of teachers and students of technical colleges.

3. Government should fund technical colleges to make the learning environment conducive and qualitative for learning.

Suggestion for further research

Based on the findings of the study, the following suggestion is made for further research:

1. A comprehensive study for development of metalwork practical skill interest inventory test for measuring teachers and students in metal work practical.

REFERENCES

Anthony P. Reynolds, 'Friction stir welding of Aluminum alloys', Handbook of Aluminum, 2004.

Allan R. Pfluger, Richard E. Lewis, 'Weld imperfections', Proceedings of a Symposium at Lockheed Palo Alto Research Laboratory, Palo Alto, California, 1996.

Cary, Howard B; Scott C. Helzer (2005). Modern Welding Technology. Upper Saddle River, New Jersey: Pearson Education. ISBN 0-13-113029-3.

Ehow.com (2012), The History of Metal Fabrication, www.ehow.com/about_5611355_history-metal-fabrication.html

Federal Ministry Education, (2004) Review of National Policy on Education; Lagos

Fletcher, M. J., 'Friction welding', 1972.

Go Welding.org (2012). The History of Welding. www.gowelding.org Accessed 12 July, 2012

Guard (1995) the Engineering process materials, Britain Allen press

Gregory L. Snow and W. Samuel Easterling Strength of Arc Spot Welds Made in Single and Multiple Steel Sheets, Proceedings of the 19th International Specialty Conference on Cold-Formed Steel Structures, Missouri University of Science and Technology, October 2008

Harry Udin, Edward R. Funk, John wulff, ' Welding for engineers', 1954.

Howard B. Cary. (1998)

Herodotus. The Histories. Trans. R. Waterfield. Oxford: Oxford University Press. Book One, 25.

HKL Technology (2010) www.hkltechnology .com Accessed 11 February, 2010

Kazakov, N.F (1985). "Diffusion Bonding of Materials" University of Cambridge. Retrieved 2011-01-13

Kenneth Budinski, 'Engineering materials: properties and selection', 1983.

Lazarev, P.P. (December 1999), "Historical essay on the 200 years of the development of natural sciences in Russia" (Russian), Physics-Uspekhi 42 (1247): 1351–1361, doi:10.1070/PU1999v042n12ABEH000750, archived from the original on 2009-12-04.

Lincoln Electric (1994). The Procedure Handbook of Arc Welding. Cleveland: Lincoln Electric. ISBN 99949-25-82-2.

Mandal, N.R., 'Aluminum welding', 2002.

Mel Schwartz (2011). Innovations in Materials Manufacturing, Fabrication, and Environmental Safety. CRC Press. pp. 300–. ISBN 978-1-4200-8215-9. Retrieved 10 July 2012.

Metallographic.com (2011), www.metallographic.com Accessed 23 August, 2011

Mohammed, A.R. (2005, June). The Role of the Private Sector in Revamping

Technical Education in Nigeria: Building Bridges to the End Users. A Paper

Presented at a National Workshop on Revamping Technical Education In

Nigeria to Face the Challenges of Technological Development. Abuja -

Nigeria. 8th-9th.

Momoh, G. D. (2005, September). Assessment in Technical and Vocational Education. A paper Presented at the International Association for Educational Assessment Conference on Assessment and the Future of Schooling and Learning. Abuja –Nigeria. 4th-9th.

Okoro, O. M (1991) the National Policy and objectives of Vocational Education; Nigeria journals of Vocational Education 3(2)116-123.

Patricia Han, 'Tensile testing', 1992.

Sapp, Mark E. (February 22, 2008). "Welding Timeline 1900–1950". WeldingHistory.org. Retrieved 2008-04-29.

Thomas, W. M., Dolby, R. E.(1997), ' Friction stir welding developments', TWI,

Cambridge, UK.

Tylecote, R. F., 'The solid phase welding of metals', 1968.

Weman, Klas (2003). Welding processes handbook. New York, NY: CRC Press LLC. ISBN 0-8493-1773-8.

APPENDIX I

(STUDENTS' QUESTIONNAIRE)

TOPIC: CHALLENGES TECHNOLOGY ADVANCEMENT IN WELDING AND FABRICATION IN TECHNICAL COLLEGES IN NIGER STATE;

I am a Student of the Department of Industrial Technology and Education in the Federal University of Technology, Minna. I am conducting a research on the above topic to improve the challenges of technology advancement in welding and fabrication in technical colleges, Niger state.

I need your candid opinion and answers to the questions attached. I promise that the information provided would be treated with absolute confidentiality for the purpose of the study.

Thank You.

John Jerome

2007/1/27299BT

SECTION A: TO OBTAIN RESPONDENT'S BIO DATA. Please tick as applicable [√]

1. Sex: Male [ ] Female [ ]
2. Age: Below 18 [ ] 18–22 [ ] 23–26 [ ] 27–30 [ ] 31–34 35-above [ ]
3. School:
   A. Government Technical College Minna, Niger State [ ]
   B. Government Technical College Iyagi Bida [ ]
   C. Government Technical College New Bussa, Niger State [ ]
   D. Government Technical College Kontagoro, Niger State [ ]
   E. Suleiman Barau Technical College Suleja, Niger State [ ]
   F. Federal Science Technical College, Kuta, Niger State [ ]
   G. Government Technical College, Pandogari [ ]
4. Status: Teachers [ ] Student [ ]

SECTION B: TO PROVIDE ANSWERS TO THE RESEARCH QUESTIONS:

1. Are there qualified teaching and technical personnel in welding and fabrication in technical colleges? Please tick as applicable [√]
   Yes [ ] No [ ]
2. Are there adequate modern equipment for the teaching and learning of welding and fabrication in technical colleges?
   Yes **[ ] No [ ]**
3. What are the problems of using modern equipment for teaching skills in welding and fabrication? (multiple option permitted)
   a Lack of technical know-how **[ ]**
   b Inadequate funding **[ ]**
   c Lack of training and retraining of staff **[ ]**
   d Bad management policy **[ ]**
   e I don't Know **[ ]**
4. Are there adequate materials and supplies for workshop practices in technical colleges in Niger state? (Please Tick [√] as appropriate).

Yes [ ] **No [ ]** Indifferent **[ ]**

APPENDIX II

Welding and fabrication curriculum in technical colleges

NTC FABRICATION AND WELDING ENGINEERING CRAFT PRACTICE

			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	218
1	CMA 11-12	Mathematics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	2	-	288
2	CEN 11-17	English	2	-	2	-	2	-	3	-	3	-	3	-	3	-	3	-	3	-	288
3	CPH 10-12	Physics	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
4	CCH 11-12	Chemistry	2	-	2	-	2	-	2	1	2	1	2	1	2	1	2	1	2	1	288
5	CEC 11-13	Economics	2	-	2	-	2	-	2	-	2	-	2	-	2	-	-	-	-	-	216
6	CBM 11	Entrepreneurship	-	-	-	-	-	-	2	-	2	-	2	-	-	-	-	-	-	-	72
7	CTD 11-13	Drawing	-	3	-	3	-	3	-	3	-	3	-	3	-	2	-	2	-	2	288
8	ICT 11-15	Computer Studies	-	-	-	-	-	-	1	2	1	2	1	2	1	2	1	2	-	-	180
9	CME 11	General Metal Work I	2	5	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168
10	CME 12	General Metal Work II	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	60
11	CFW 11	Sheet Metal Work	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	-	-	216
12	CFW 12	Gas Welding and Cutting	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	-	-	216
13	CFW 13	Metal Arc Welding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	216
14	CFW 14	Structural Steel Work	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	3	6	216
15	CFW 11	Steel Metal Work	-	-	-	-	-	-	-	-	-	-	2	6	2	5	-	-	-	-	180
		GRAND TOTAL	12	8	12	8	12	6	14	7	14	7	14	7	18	18	22	30	15	16	2928

Source: Curriculum and Module Specifications for National Technical Certificate (NTC)