TASKS AND NEEDS ANALYSIS OF WELDING AND FARBICATION PRACTICES IN MINNA METROPOLIS, NIGER STATE

BY

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2016/1/62654TI

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FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE.

APRIL, 2023

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, SCHOOL OF TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B. TECH) DEGREE IN INDUSTRIAL AND TECHNOLOGY EDUCATION.

APRIL, 2023

DECLARATION

I, **NURUDEEN, Isah** with matriculation number **2016/1/62654TI**, an undergraduate student of the department 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.

NURUDEEN, Isah

2016/1/62654TI Sign and Date

CERTIFICATION

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

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External Examiner Signature and Date

DEDICATION

With profound joy and gratitude in my heart, I dedicate this project to God Almighty for His Unshakable and Unbreakable Faithfulness. His Divine and constant guidance in my life has made this project a reality today. Thank God.

ACKNOWLEDGEMENTS

My continuous gratitude goes to God Almighty who has made it possible for me to be able to successfully write this research project and who has shown me mercy and made me who I am today and for what He will still yet do in my life for this is just the beginning, may His name alone be glorified both now and forever (Amen).

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I also want to use this medium to appreciate the outstanding, reliable, efficient Educational Technology lecturers that have taught me throughout my program and also all workshop technicians. Thanks a lot, May God honour and bless you all.

I am highly and in no small measure very grateful to my beloved parents, Alhaji Isah Kpetu and Mallama Hassana Usman for their prayers and support.

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ABSTRACT

The purpose of this study was to determine the task and needs analysis of welding and fabrication practices in Minna metropolis, Niger state. The study adopted a survey research design. The population of the study consists of two groups, group one comprised of 87 fabrication and welding technical teachers in the Technical colleges and 19 secondary schools in the state offering fabrication and welding subject. The second group comprised of 12 Industrial fabrication and welding supervisor and 84 fabrications and welding craftsmen registered with the Niger state Ministry of labour and productivity. There was no sampling as the population 183 respondents are not large, accessible and manageable. Four research questions and four hypotheses, tested at 0.05 level of significance, the instrument used for data collection was a structured questionnaire. The instrument was subjected to face and content validation by five experts, two from the Department of Industrial and Technology Education, Federal University of Technology Minna and three expert from welding and fabrication industries in Niger State. The reliability coefficients was found to be 0.91 by trial testing it on 10 Technical teachers and 20 fabrication and welding Industrial supervisor which was not part of the respondents used for this study. Data obtained from the administration of the instrument was analysed using mean, standard deviation to answer the research question and t-test statistic was used to test the hypotheses. eight major findings were made. These findings, included. Problem solving skill required by fabrication and welding craftsmen as perceived by related industries, communication skill required by fabrication and welding craftsmen as perceived by related industries, self management skill required by fabrication and welding craftsmen as perceived by related industries and critical thinking skill required by fabrication and welding craftsmen as perceived by related industries. Also the hypotheses tested found out that: there was no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries. There were no significant difference in the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries. There was no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen. And the last hypothesis also corroborate the others that there is no significance difference in the mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries. Based on these findings, conclusions were drawn and recommendations proffered.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Today's technical college students are expected to learn skill content better to the extent that they can fit into 21st century jobs. In doing so, the students' are expected to develop the "hard" technical skills as well as the "soft" people skills necessary to be successful in the industry level. "Core," "key," "transferable," "general," "non-technical" and "soft" are all terms that have been used synonymously to define the work skills needed most in industry. While the semantics of the term used do exist, there is no doubt that there is a need for such skills in the workplace. Core skills are the technical know how and the methodology of carrying out the works involve in the practical activities in the welding and fabrication industry. The core skills emanated from safety precautions on tools and materials handling down to the finished products processes. Key skills are things that craftsmen need to posses if their team is to thrive and succeed. These range from ability to choose the right people and deciding who does what, to communicating with, developing and motivating people. This involves the supervisors' duty of setting direction, communicating that vision passionately to those they work with, and helping colleagues understand and commit to that vision. Supervisor, on the other hand, are responsible for ensuring that the vision is implemented efficiently and successfully.

A supervisor is in charge of a small group's day-to-day performance. It could be a shift or a team. The person in charge knows what the group does, but that doesn't mean they are better than everyone else. It is the responsibility of the supervisor to direct the team toward its objectives, ensure that each member of the team is productive, and deal with any issues that may arise. His responsibilities include assessing and correcting the general skills of the craftsmen. According to Ackerman, (2012), there has been a steady stream of reports and

papers urging the higher education sector to take key, core, transferable, and employability skills into the heart of students' learning experience.

Graduates begin careers in specialized positions, this make the students' finds it difficult to acquire skill in a way that meets all employers' needs. Technical skills are job specific and best suited to be taught by industry professionals on the job. "Soft" skill development is needed by all technical college graduates (Mkposi, 2016). Ezeji (2004) stated that Society, now more than ever, needs graduates who criticize in constructive ways and do not assume that things should be done only in a certain way because that is the 'way it has always been done; rather craftsmen who want to work in organizations that strive to correct past mistakes, not contribute to new ones. The purpose and role of technical education has been widely debated for years. Orikpe (2014) stated that the debate is centered on whether technical education should exist for the sole purpose of providing capitalistic achievement or in-depth liberal education; this has been viewed differently by many nations.

Welding and fabrication engineering craft practice deals with the forming and bonding of metals to form a useable object or structure. Fabrication is the forming of metal, usually steel plate, into various forms either by welding or other forms of metal joining processes. Welding is used to cover a range of bonding techniques. Welding is a way of joining two or more pieces of metal together permanently. Reeves and Woodward (2007), described welding as an action that occurs when metal pieces being joined flows and blends or fuses together. They explained that, the action is caused by heat, pressure or a combination of both. When heat alone is used according to them, the weld action is known as fusion weld. Sulaiman (2010) sees welding as a joining technique for both fabrication in production and for repairs, construction of ships, boilers and large storage, pipelines and rail lines. The author further stated that welding and fabrication involves metals and the joining actions caused by the application of heat, pressure, and with or without filter materials.

Degarmo, e*t al.*, (2003) stated that welding is a fabrication process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the workpieces and adding a filler material to form a pool of molten material that cools to become a strong joint, but sometimes pressure is used in conjunction with heat, or by itself, to produce the weld. Hence welding and fabrication has various trades which can provide individual with saleable skills. Some of these trade includes, gas welding, resistant welding, arc welding, thermit welding, and underwater welding.

Communication skills as described by Commonwealth of Australia (2006) as those skills that help customers, employers, and employees work together in a productive way. The most prevalent employability skill is communication skills. This is due to the fact that all work practices involve speaking, listening, reading, and/or writing, and very few examples of units of competency do not include at least some aspects of communication. In order to provide a safe and high-quality working environment, it is necessary to communicate effectively. Inadvertent issues in the workplace are frequently brought on by poor communication. Because of the inherent limitations of human performance and the complexity of industrial activities, it is critical that welding and fabrication technicians have standard communication tools, create an atmosphere where people can voice their concerns, and use common "critical language" to alert team members to dangerous situations.

Self-management skills are those skills that contribute to the growth and satisfaction of employees. According to Commonwealth of Australia (2006), the ability of an individual to manage themselves in relation to the outcomes expected of their work role is referred to as self-management. This ability includes the capacity to learn new things, the capacity to collaborate with people of any sex, age, or race, and the capacity to manage one's time. Workplace decision-making known as worker self-management involves workers coming to an agreement on their own options (for things like customer service, general production methods, scheduling,

labor division, and so on). instead of workers being instructed by an owner or traditional supervisor about what to do, how to do it, and where to do it. In cooperative economic arrangements, such as workers' cooperatives, workers' councils, participatory economics, and similar arrangements in which the workplace operates without a boss, the decision-making model of workers self management is frequently utilized. However, real-world examples demonstrate that only large-scale decisions are made by all employees at council meetings, while implementation decisions are made in coordination with the rest and in accordance with more general agreements.

Problem solving skills is one of the higher-order thinking abilities that are required by industries. They are abilities that aid in the expansion and competitiveness of industries, employees, and employers worldwide. According to the Commonwealth of Australia (2006), graduates should be able to prioritize, solve problems individually or in groups, make decisions based on a thorough evaluation of the short- and long-term effects of those decisions, and conceptualize the company's future and suggest novel routes.

Critical thinking is the intellectual procedure of evaluating, analyzing, and combining various assertions or observations. Additionally, critical thinking can be defined as the capacity to develop a conceptual understanding of what takes place and apply that understanding in a variety of contexts in addition to simply describing something or accepting what is perceived as wisdom. According to Prosser (2004), critical thinking can be referred to as an approach that gives problem-solving wings in engineering. It means that you are willing to question what you are told and to think it through on your own by reflecting on the material. The curriculum of technical colleges typically does not take into account soft skills; rather, it merely outlines the technical activities that are necessary for the operation to be carried out safely. Even though the core skill is just as important, the craftsmen's soft skills help them build successful relationships with coworkers and customers.

The National Skills Task Force and associated research studies (2005) make a distinction between internal skills gaps (inadequate proficiency levels among a company's workforce) and skills shortage vacancies (vacancies caused by applicants' lack of required skills, work experience, or qualifications). These, in turn, indicate vacancies that are difficult to fill, which employers perceive to be closely related to levels of formal qualifications and may be interpreted as evidence of a mismatch in the supply and demand of skills. According to the Nigerian Employers Consultative Association (NECA) (2005), there was a general lack of applicants and dissatisfaction with the skills that were already in place. Employers of metal workers say that there aren't enough people applying who have the right skills, but also have the right experience and qualifications. This is a bigger problem than it is in other industries. According to NECA, applicants for skilled craft jobs lack technical, practical, and customer service skills, suggesting that businesses are relying on unskilled labor. According to the Employer Skills Survey (2002), recruitment issues prevent over three-quarters of businesses from meeting customer service standards. The best pedagogy and practice, as well as an understanding of the work skills requirements of artisans as perceived by trade-related industries, are necessary for successful education. Because the graduate's skills will match those required by the industry, they will be employable.

1.2 Statement of the Problem

Niger State is blessed with enormous resources that, if managed properly; Every citizen ought to have a comfortable life. This is due to the fact that a variety of individuals, businesses, and investors are in the region conducting one kind of business or another, thereby positively affecting the lives of residents, such as; foundation, power, pipe borne water, well-rounded schooling, exceptional emergency clinics, better and more present day hardware for fishing, cultivating and hunting. With the expectation that more people would have access to

opportunities for gainful employment as the oil companies begin their operations, good roads would link communities.

The majority of graduates and school leavers from the state's primary, secondary, and polytechnic institutions are typically expected to work for these businesses, the government, or for themselves to earn a living. However, the opposite is true because the government does not create employment opportunities in proportion. Due to either a mismatch in skills or a lack of qualified indigenous skills, businesses continue to bring foreign expatriates into the state to perform specific tasks (requiring special skills). Either a lack of employment or a lack of employable skills cause people to be unemployed. If the individuals are to be employed, the latter requirement must be satisfied. In order to provide the unemployed with employable skills that may be lacking, it is crucial to provide relevant job skills. People will always be out of work if they don't have skills that can be used in the workplace. Ozigbo (2008) lamented Nigeria's lack of skilled human capital to manage the oil industry despite its wealth of oil production.

1.3 Purpose of the Study

The purpose of the study is to determine the task and needs analysis of welding and fabrication practices in Minna Metropolis, Niger State. Specifically the study is designed to:

1. Determine Problem solving skill required by fabrication and welding craftsmen as perceived by related industries.
2. Identify Communication skill required by fabrication and welding craftsmen as perceived by related industries.
3. Examine Self management skill required by fabrication and welding craftsmen as perceived by related industries.

4. Identify Critical thinking skill required by fabrication and welding craftsmen as perceived by related industries.

1.4 Significance of the Study

The results of this research study will be beneficial to the Curriculum Planners and the Government. This will provide them with the needed information about the existing gap between the graduates expected non-technical competences and knowledge required for employment. The Government will see the need to provide the needed resources for the acquisition of the needed non-technical and technical skills required for employment by graduates.

The society at large will finally stand to benefit from the findings of this study if the identified skills are then included in the technical college curriculum. The kind of human resources that will be enterprising and productive in the society will be produced. The socioeconomic life of the society will improve as graduates will be able to face the present and future challenges in the world of work. This would assist in reducing some social vices and other criminal activities, which results from graduate unemployment and idleness.

1.5 Research Questions

1. What are the problem solving skills required by fabrication and welding craftsmen as perceived by related industries?
2. What are the communication skills required by fabrication and welding craftsmen as perceived by related industries?
3. What are the self management skills required by fabrication and welding craftsmen as perceived by related industries?
4. What are the critical thinking skills required by fabrication and welding craftsmen as perceived by related industries?

1.6 Hypotheses

The following null hypotheses which will be tested at 0.05 levels of significance are formulated to guide this study:

H_{01}: There is no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries.

H_{02}: There is no significant difference in the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries.

H_{03}: There is no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen.

H_{04}: There is no significance difference in the mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Welding and Fabrication

Welding is a way of joining two or more pieces of metal together permanently. Welding is act, specifically comprising a wide range of bonding techniques. Repp and McCarthy (2014) described welding as an action that occurs when metal pieces being joined flows and blends or fuses together. They explained that, the action is caused by heat, pressure or a combination of both. When heat alone is used according to them, the weld action is known as fusion weld.

Howard (2012), citing the American Welding Society, stated that welding is a joining process that produces coalescence of materials by heating them to the welding temperature, with or without the application of pressure or by the application of pressure alone, and with or without the use of filler metal. Sowande (2002) sees welding as a joining technique for both fabrication in production and for repairs, construction of ships, boilers and large storage pipelines and rail lines. The basic concepts of welding as described by the authors above involves metals and the joining actions caused by the application of heat, pressure, and with or without filter materials.

Welding process is broadly classified according to Davies (2004) as fusion welding an solid-phase welding. He explained that fusion welding is the process of joining two or more pieces of metal by the application of heat, while solid-phase. Welding is produced by bringing the clean faces of components into intimate contact to produce a metallic bond with or without application of heat but pressure is applied.

2.1.2 Skill Acquisition: Measurement, Theory and Research

In today's increasingly technical world, many jobs require the acquisition of a variety of simple and complex skills, for instance (Lane, 1987). However, the problems associated with how one acquires a skill are numerous and complex (Robb, 1972). An important aim of many training programs is to develop in trainees the capability to perform complex "real world" tasks, with a minimum investment of resources. Training could aim to raise the level of performance, and minimise the range of individual differences in performance, by revealing which abilities influence learning, and other possible moderating variables, (Ackerman & Kyllonen, 1991) and to identify the differing needs of trainees at different stages of practice, so that training programs can keep pace with different ability requirements at different stages (Mumford, Costanza, Baughman, Threlfall & Fleishman, 1994). Different theories and the precise measurement of skill acquisition are vital for ensuring the optimal application of training programs in the wide variety of settings that exist.

2.1.3 Skill Acquisition Theory of development

Drucker (2010) noted that the Skill Acquisition Theory of development has three stages: declarative, procedural, and automatic (from ACT-R Theory). Declarative knowledge refers to explicit knowledge about a topic, as in "knowing" and talking about grammar rules. Procedural knowledge is implicit knowledge that refers to behaviour, such as speaking or writing a language. Of course, there are different levels of proficiency in using a language, and thus automaticity is not an "all-or-nothing affair". Automaticity occurs toward the endpoint of extensive practice, toward the point at which one has become completely fluent in a language. From the perspective of SAT, the sequence of these stages is crucial, as is the appropriate combination of abstract rules and concrete examples at the declarative stage. According to

Drucker, (2010) skill Acquisition Theory does not explain all of language learning and apparently is most effective at beginner levels.

Due to their limited capacity for understanding rules and explanations, young children will not respond as well as adults to the use of declarative knowledge. On the other hand, rules may become too difficult to comprehend as declarative knowledge as they become more complex. As a result, it's possible that implicit processes are more important when learning (or acquiring) complex rules. Both Anderson and Schunn make similar statements: The underlying cognitive structure of knowledge domains tends to become more obscure as they advance. As a result, while providing feedback on the final answer may still be simple, it becomes more challenging to provide feedback on the various mental steps that led to the final answer. Teachers frequently lack the knowledge and skills necessary to impart this knowledge to students on an explicit level. In order to give good feedback, Adeyemi and Uko-Aviomoh (2004) say that a task needs to be diagnosed and broken down into its parts. When we are unable to componentize a task, feedback is significantly less effective. Thus, with respect to error correction, we need

- rules that are not obscure,
- examples of the rules, and
- Understandable explanations of those rules.

The ability to use declarative knowledge in the learning process does not accelerate acquisition.

2.2 Conceptual framework

2.2.1 Importance of fabrication and welding

Welding is a process of permanent joining two materials (usually metals) through localized coalescence resulting from a suitable combination of temperature, pressure and metallurgical conditions. Depending upon the combination of temperature and pressure from a high

temperature with no pressure to a high pressure with low temperature, a wide range of welding processes has been developed.

Classification of Welding Process

American Welding Society (2005) classified the welding processes as differ in the manner in which temperature and pressure are combined and achieved. Welding Processes can also be classified as follows (based on the source of energy):

1. Gas Welding

- Oxyacetylene
- Oxy hydrogen

2. Arc. Welding

- Carbon Arc
- Metal Arc
- Submerged Arc
- Inert-gas-Welding

TIG and MIG

- plasma Arc
- Electro-slag

3. Resistance Welding

- Spot
- Seam
- Projection
- Butt Welding
- Induction Welding

4. Solid State Welding

- Friction Welding
- Ultrasonic Welding

- Explosive Welding
- Forge and Diffusion Welding

5. Thermo-Chemical Welding - Thermit Welding

- Atomic H2 Welding

6. Radiant Energy Welding

- Electron Beam Welding
- Laser Beam Welding

In order to obtain coalescence between two metals there must be a combination of proximity and activity between the molecules of the pieces being joined. Sufficient to cause the formation of common metallic crystals. Proximity and activity can be increased by plastic deformation (solid-state welding) or by melting the two surfaces so that fusion occurs (fusion welding). In solid-state-welding the surfaces to be joined are mechanically or chemically cleaned prior to welding while in fusion welding the contaminants are removed from the molten pool by the use of fluxes. In vacuum or in outer space the removal of contaminant layer is quite easy and welds are formed under light pressure.

Condition for Obtaining Satisfactory Welds

To obtain satisfactory welds it is desirable to have:

- A source of energy to create union By fusion or pressure
- A method for removing surface contaminations
- A method for protecting metal from atmosphere contamination
- Control of weld metallurgy

Source of Energy

Energy supplied is usually in the form of heat generated by a flame, an arc, the resistance to an electric current, radiant energy or by mechanical means (friction, ultrasonic vibration or by explosion). In a limited number of processes, pressure is used to force weld region to plastic

condition. In fusion welding the metal parts to be joined melt and fuse together in the weld region. The word fusion is synonymous with melting but in welding, fusion implies union. The parts to be joined may melt but not fuse together and thus the fusion welding may not take place.

Applications of Welding

- Welding finds its applications in automobile industry, and in the construction of buildings, bridges and ships, submarines, pressure vessels, offshore structures, storage tanks oil, gas and water pipelines, girders, press frames, and water turbine.
- In making extensions to the hospital building, where construction noise is required to be minimum, the value of welding is significant.
- Rapid progress in exploring the space has been made possible by new methods of welding and the knowledge of welding metallurgy.
- The process is used in critical applications like the fabrication of fission chambers of nuclear power plants.
- A large contribution, the welding has made to the society, is the manufacture of household products like refrigerators, kitchen cabinets, dishwashers and other similar items. It finds applications in the fabrication and repair of farm, mining and oil machinery, machine tools, jigs and fixture, boilers, furnaces, railway coaches and wagons, anchor chains, earth moving machinery, ships, submarines, underwater construction and repair.

Selection of a Welding Process

Welding is basically a joining process. Ideally a weld should achieve a complete continuity between the parts being joined such that the joint is indistinguishable form the metal in which the joint is made. Such an ideal situation is unachievable but welds giving satisfactory service can be made in several ways. The choice of a particular welding process will depend on the following factors.

1. Type of metal and its metallurgical characteristics

2. Type of joint, its location and welding position
3. End use of the joint
4. Cost of production
5. Structural (mass) size
6. Desired performance
7. Experience and abilities of manpower
8. Joint accessibility
9. Joint design
10. Accuracy of assembling required
11. Welding equipment available
12. Work sequence
13. Welder skill

Frequently, multiple processes can be utilized for a single task. The procedure ought to be designed in such a way that it is most suitable in terms of cost and technical requirements. It's possible that these two things don't go together, necessitating a compromise. One of the most important tasks in today's offshore, shipbuilding, and fabrication industries is welding. The structural design, production planning, utilized welding technology, and distortion control measures implemented during fabrication all have an impact on these industries' performance in terms of product quality, delivery schedule, and productivity. The following factors influence the quality of welding: Work layout, plate edge preparation, fitup and alignment, shielding medium and working environment, welding parameters, dimensional accuracy, correct processes and procedures, and appropriate distortion control procedures are all important factors. In the welding and fabrication processes, the aforementioned parameters are of the utmost importance.

Welding and Fabrication is one of the trade courses offered in the Technical colleges in Nigeria, the trade course prepares the products for craftsmanship training as welder and fabricator. Welders are required to make, join and repair the metal parts for a massive range of machinery, equipment and structures while Fabricators are involved in the creation and repair of either light (water tanks, ducting, metal chains) or heavy metals (i.e. building structures, ships' hulls, bridges). As a fabricator you are likely to specialise in either light metal fabrication - including ducts, water tanks, metal chairs, and aircraft parts or in heavy metal fabrication - including building structures, ships hulls, and bridges. As a welder you are likely to find employment in one of the following types of organisations: Architectural, Agricultural, Marine, Transport, Structural, Heavy automotive or General engineering. Students in the welding and fabrication trade course (welding and structural steel) will gain the fundamental skills required to gain employment as a welder. These include skills in: Interpreting drawings, making calculations, Industry safety, Thermal cutting, Arc welding and MIG welding.

Types of Welding

- Fusion Welding – melting base metals
  - Arc Welding (AW) – heating with electric arc
  - Resistance welding (RW) -heating with resistance to an electrical current
  - Oxyfuel Welding (OFW) -heating with a mixture of oxygen and acetylene (oxyfuel gas)
  - Other fusion welding -electron beam welding and laser beam welding
- Solid State Welding no melting, no fillers
  - Diffusion welding (DFW) – solid-state fusion at an elevated temperature
  - Friction welding (FRW) – heating by friction

– Ultrasonic welding (USW) – moderate pressure with ultrasonic oscillating motion Welding Operation

- 50 types processes (American Welding Society) AWS (2008)
- Applications: Constructions, Piping, pressure vessels, boilers and storage tanks, Shipbuilding, Aerospace, Automobile and Railroad
- Welder - manually controls placement of welding gun
- Fitter assists by arranging the parts prior to welding
- Welding is inherently dangerous to human workers

– High temperatures of molten metals,

– Fire hazard fuels in gas welding,

– Electrical shock in electric welding

– Ultraviolet radiation emitted in arc welding (a special helmet with a dark viewing window) and – Sparks, spatters of molten metal, smoke, and fumes (good ventilation).

- Automation - Machine, Automatic and Robotic welding

2. The Weld Joint

- Types of Joints

– Butt joint

– Corner joint

– Lap joint

– Tee joint

– Edge joint

- Types of Welds

– Fillet weld

– Groove weld

– Plug and slot welds

– Spot and Seam welds

– Flange and Surfacing welds Physics of Welding

• Coalescing Mechanism: Fusion via high-density energy

• Process plan to determine the rate at which welding can be performed, the size of the region and power density for fusion welding

• Powder density (PD): where P = power entering the surface, W (Btu/sec); and

A = the surface area, mm2 (in2)

– With too low power density, no melting due to the heat conducted into work

– With too high power density, metal vaporizes in affected regions

– Must find a practical range of values for heat density.

• In reality, pre & post-heating and non uniform

• For metallurgical reason, less energy and high heat density are desired.

2.2.2 Critical thinking Skills

Critical thinking takes place in a mental environment consisting of experiences, thoughts, and feelings. Some elements in this inner environment can sabotage efforts to think critically or at least make critical thinking more difficult. Fortunately, some control can exert over these elements. With practice, errors in thinking can be detected for, it restrains attitudes and feelings that can disrupt our reasoning, and achieve enough objectivity to make critical thinking possible. The most common of the hindrances to critical thinking fall into two main categories: Those obstacles that crop up because of the think process and those that occur because of what is thought. The first category is comprised of psychological factors such as fears, attitudes, motivations, and desires. The second category is made up of certain philosophical beliefs.

Team Work Skill

To succeed at the task in hand everyone involved needs to combine their efforts. If everyone does their job well, then it increases what the team can accomplish. This teamwork has to be recognised by everyone and know that great things can happen if individuals master the fundamentals and work together as one unit. Everyone has their own unique role, but each person's individual role must be recognised and appreciated. Teamwork is something that must be a high priority and given constant attention. Every player needs to understand how important it is for them to work smoothly together if they want to be successful. Each player must be dedicated to the whole team and be willing to act unselfishly. When challenges arise (as they always do), the team needs to have the resources, accountability and commitment to deal with them in a constructive and positive manner. A sense of teamwork will play an integral part in this. T.E.A.M. Together Everyone Achieves More. The human factor: the critical importance of effective teamwork and communication in providing safe care.

Effective communication and teamwork is essential for the delivery of high quality, safe working environment. Communication failures are an extremely common cause of inadvertent problem in working environment. The complexity of Industrial activities, coupled with the inherent limitations of human performance, make it critically important that welding and fabrication technicians have standardised communication tools, create an environment in which individuals can speak up and express concerns, and share common "critical language" to alert team members to unsafe situations. All too frequently, effective communication is situation or personality dependent. Other high reliability domains, such as commercial aviation, have shown that the adoption of standardised tools and behaviours is a very effective strategy in enhancing teamwork and reducing risk.

In a general sense people talk of teamwork when they want to emphasise the virtues of cooperation and the need to make use of the various strengths of employees. Teams have been around for as long as anyone can remember and there can be few organisations that have not used the term in one sense or another. It is common to hear of management teams, production teams, service teams or even whole organisations being referred to as teams. Employers stress the importance of employees working as a team and advertise for staff with the ability to work in such a way. In a general sense people talk of teamwork when they want to emphasise the virtues of cooperation

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The concept of teamwork is extremely important to the success of any team. All coaches talk about working as one unit, as a unified team. Teamwork and unselfishness create the backbone of a great team, without them a team cannot realistically compete. You can have a group of superstars, but if they do not work well as one unit, chances are they are not going to be as

successful as you would think. The team working as one cohesive unit is going to be the key in their success. (Knootz 2003).

Critical thinking and reflection are at the heart of higher education and university learning and are fundamental for all disciplines. The widening of participation in higher education calls for new approaches which enable students to develop these abilities for academic purposes. They are also seen as 'key skills' which employers expect graduates to bring to the workplace from school. Critical thinking and reflection are often referred to in descriptions of the characteristics of both higher education itself (Baba, 2012) and of graduates (Daff, 2017).

Thinking critically helps students to develop as autonomous learners who can engage more confidently in debate within their subject area at a high level (Sheyin 2006). A well known writer on critical thinking, Jenny Moon, gives the following definition: Critical thinking is a capacity to work with complex ideas whereby a person can make effective provision of evidence to justify a reasonable judgment. The evidence, and therefore the judgement, will pay appropriate attention to context. Critical thinking is the intellectual process of analysing, evaluating and synthesising observations or assertions. Also Critical thinking could be described as the ability to not just describe something or accept perceived wisdom, but develop a conceptual understanding of what happens and transfer that to different situations. Maxwell (2001) posits that, Critical thinking can be described in engineering as a means to give problem-solving wings. In education it means not just accepting what you are told but a willingness to question it, to think it through for yourself by reflecting on the content.

Laying the Foundations for effective teamwork can be achieved by imparting the skill of team spirit in students; this may be developed in students by lectured instruction on these skills and by explicitly delegating to each team member the responsibility for applying them. In Industry, the use of small teams is rapidly becoming seen as a panacea leading to certain success. In

Quality Circles, Concurrent Engineering, and in many other management innovations, the team is the organisational unit to which creative control is being delegated and the training of such teams is therefore vital to an Industrial success. For the professional welding and fabrication craftsman, the ability to work effectively as part of such teams is an essential skill.

In Education, small groups are used to manage and enhance learning activity. In educating engineering students therefore, there is a double impetus to the teaching of team skills: firstly to enhance learning, and secondly to train the students in a skill now necessary for their professional development. James (2002) identifies learning in groups approaches to improving group behaviour which focus primarily upon the development of the teaching staff to enable the student direct the groups. However, there is but little mention of explicit training in team skills for the students; yet without these skills, the students' effectiveness in group learning will be reduced.

It is important that welding and fabrication students be equipped to appreciate team skills. To maintain that awareness requires that the students are allowed to practice these skills and that they reflect upon them and their own performance. In general, however, it is wise to raise the issue of team effectiveness in any situation when teams are being used. The message is that a little management of the team process will greatly enhance the team's performance. Teamwork is the co-operative effort by a group of people to achieve a common goal. Achievement is usually measured by some kind of performance indicator (eg: customer satisfaction, sales growth). Teamwork is improved when the group changes their behaviour so that performance improves.

Group projects allow the assessment of students' interpersonal communications skills and their ability to function as a team member. The assessment of group projects presents essentially all of the same considerations as the assessment of individual works plus the additional need to

evaluate individual efforts. As each individual can learn from other team members, the group product should be expected to be better than that produced by a single individual. If teams are to be efficient, specific roles must be defined and the assessment process needs to determine how well each individual performs a specific role.

Team members of high ability contribute most to a team when other members are also of high ability. However, in forming and managing a team, t is important to consider not only individuals' technical skills, knowledge and experience but also their ability to co-ordinate actions and their interpersonal qualities. In selecting potential members, it is important to look for people who will work constructively with others and have a willingness to grow and develop within the team. Preferably, team members will be selected who are able to: commit to a shared goal listen and respond to others in an objective and productive way take on different roles in the group in order to accomplish shared ends be open and honest with their ideas, concerns and values avoid carrying hidden agendas into team meetings. Those unlikely to work well as team members are individuals who seek to maintain their position by protecting their experience or who prefer to work alone and unaided and are unwilling to discuss their assumptions, negotiate options or explain solutions.

Leadership is critical to teamwork. The team leader is the person responsible for ensuring that members work effectively together to achieve their goal or objective and must facilitate the co-operation necessary for the team to perform well. The leader must also ensure that the team has the resources and information necessary to complete its task. The leader should be a role model for the team good at communicating openly and honestly and winning the respect and trust of all involved. Creating opportunities for team members to participate and contribute to the task constructs a sense of common ownership of both the problem and its solution.

2.2.3 Communication skills

Communication is the process of transmitting and understanding information and ideas so the team develops shared understanding. Good communication between members is essential if a team is to collaborate successfully and make best use of its pooled knowledge. Team identity and group cohesiveness benefit from good communication. Conversely, lack of communication where members work individually and lose touch with how their work relates to others can reduce team effectiveness. Open communication and information sharing: help team members to anticipate what they can expect from one another and when they can expect it, eliminate surprises and make it easier for members to work together. Engender trust and familiarity among team members allows more forceful group behaviour, including the willingness to question and challenge in the search for better solutions. Shared understanding means that both the person who sends a message and the receiver interpret the message and the actions it implies, in the same way. This requires expressing ideas clearly and using body language relaxed posture, good eye contact and occasional pauses to show feedback is welcome being flexible enough to take on board others' suggestions and to build on others' ideas between team meetings, keeping all those who need to know regularly informed of individual progress. Listening is just as important as speaking and involves paying attention to the whole of the sender's message and seeking to interpret it from the perspective of the sender.

Body language can be used to show full attention and interest. Restating the message in your own words to clarify the sender's intended meaning can be helpful. To seek constructive clarification, ask supportive questions focused on what, where, how and why issues. This allows the speaker to explain the position in more detail. Practical steps to promote open communication highlight the importance of open communication and the mutual benefits for the team. Set objectives don't let the team just talk around the job remind team members of the importance of arriving at meetings prepared to communicate ideas and use drawings and

diagrams where appropriate recognise that not all are good communicators others on the team should help them to articulate their views

2.2.4 Problem Solving

The initial steps in assessing problem-solving are obvious in that we need to identify what skills are to be assessed and what purpose will be served by the assessment. Once those objectives are identified, it becomes much easier to approach the task of assessing the problem-solving skills of our students. Problem-solving skills are included in the eight teaching goals as higher order thinking skills (Dalela and Mansoor, 2010). Once teaching goals are identified, progress is easily made in recognizing (and avoiding) potential pitfalls with an assessment activity. One method of implementing this advice could be to introduce assessment techniques relatively early in the curriculum of any major and progress to more sophisticated assessment procedures in upperdivision courses. Also Dalela and Mansoor (2010) identifies 50 classroom assessment techniques and provides discipline-based examples. The discussion of individual assessment techniques includes a summary of the amount of faculty time involved in preparation of the activity as well as the amount of student time involved in responding and of faculty time required for analysis.

A variety of assessment techniques may be used for assessing problem-solving skills and other higher-order thinking skills. Each can be readily modified for use in a range of curricula. To determine which assessment technique to use for which course, review the Pros, Cons, and Caveats discussions at the end of each of the individual assessment techniques relating to problem-solving skills training to the performance of adolescent educationally at-risk students. A model based on the belief that both educational risk level and problem solving skills training would influence behavioural efficacy and attempted to investigate processes related to locus of control and self- efficacy that underlie this influence. A quasi experiment first varied the

problem solving skills training (trained, not trained) at different levels of student educationally at-risk students (at-risk, non-risk) and then measured problem-solving cognitive skill, locus of control, self-efficacy, and behavioural outcome efficacy on a sample of 88 students. Separate models for at-risk and non-risk students evolved. Models for both groups represent a process in which problem solving skills training influences locus of control (positively for at-risk but not positively for non-risk students) which then increases self-efficacy and subsequent behavioural outcome efficacy.

Problem-solving skills training can be used to increase the performance of Welding and fabrication students. This study began with a model based on the belief that both educational-risk level and problem solving skills training would influence behavioural efficacy and attempted to investigate processes related to locus of control and self-efficacy that underlie this influence. A quasi experiment first varied the problem solving skills training (trained, not trained) at different levels of student educationally at-risk students (at-risk, non-risk) and then measured problemsolving cognitive skill, locus of control, self-efficacy, and behavioural outcome efficacy on a sample of 88 students. Separate models for at-risk and non-risk students evolved. Models for both groups represent a process in which problem solving skills training influences locus of control (positively for at-risk but not positively for non-risk students) which then increases self-efficacy and subsequent behavioural outcome efficacy.

A seven-step problem solving cycle

There are a variety of problem solving processes but each process consists of a series of steps, including identifying an issue, searching for options and putting a possible solution into action. It is useful to view problem solving as a cycle because, sometimes, a problem needs several attempts to solve it, or the problem changes. Figure 1 shows a seven-step problem solving cycle.

To solve a problem, take the following steps, one at a time.

Step 1. Identify the problem

The first step you need to take is to identify and name the problem so that you can find an appropriate solution. Sometimes you might be unsure about what the problem is: you might just feel general anxiety or be confused about what is getting in the way of your goals. If it is a personal problem you can ask yourself, your friends or a counsellor, 'What is the problem which is getting in the way of me achieving my goal'. If it is an academic issue you can ask yourself, 'What is hindering me from completing this task', and you can consult with your tutor, supervisor or a Learning Adviser to clarify the issue.

Step 2. Explore the problem

When you are clear about what the problem is you need to think about it in different ways.

You can ask yourself questions such as:

- 'How is this problem affecting me?'
- 'How is it affecting others?'
- 'Who else experiences this problem?'
- 'What do they do about it?'

Seeing the problem in different ways is likely to help you find an effective solution.

Step 3. Set goals

Once you have thought about the problem from different angles you can identify your goals. What is it that you want to achieve? Sometimes you might get so frustrated by a problem that you forget to think about what you want. For example, you might become ill, struggle to

complete a number of assignments on time and feel so unmotivated that you let due dates pass. It is important at this time to consider the question, ‘What is my immediate goal?’ Do you want to:

- improve your health?
- increase your time management skills?
- complete the assignments to the best of your ability?
- finish the assignments as soon as possible?

If you decide your goal is to improve your health that will lead to solutions which are different from those linked to the goal of completing your assignments as soon as possible. One goal may lead you to a doctor and/or to take leave of absence from university; the other goal may lead you to apply for extensions for your assignments. So working out your goals is a vital part of the problem solving process.

Step 4. Look at Alternatives

When you have decided what your goal is you need to look for possible solutions. The more possible solutions you find the more likely it is that you will be able to discover an effective solution. You can brain-storm for ideas. The purpose of brain-storming is to collect together a long list of possibilities. It does not matter whether the ideas are useful or practical or manageable: just write down the ideas as they come into your head. Some of the best solutions arise from creative thinking during brain-storming. You can also seek ideas about possible solutions from friends, family, a partner, a counsellor, a lecturer, books or the internet. The aim is to collect as many alternative solutions as possible.

Step 5. Select a possible solution

From the list of possible solutions you can sort out which are most relevant to your situation and which are realistic and manageable. You can do this by predicting outcomes for possible solutions and also checking with other people what they think outcomes might be. For example, if a possible solution is withdrawing from a course and it seems realistic and manageable

Step 6 Implement a possible solution

Once you have selected a possible solution you are ready to put it into action. You will need to have energy and motivation to do this because implementing the solution may take some time and effort. (If the solution had been easy to find and do, you would have probably already done it.) You can prepare yourself to implement the solution by planning when and how you will do it, whether you talk with others about it, and what rewards you will give yourself when you have done it.

Step 7. Evaluate

Just because you have worked your way through the problem solving process it does not mean that, by implementing the possible solution, you automatically solve your problem. So evaluating the effectiveness of your solution is very important. You can ask yourself (and others) :

- ‘How effective was that solution?’
- ‘Did it achieve what I wanted?’
- What consequences did it have on my situation?’

If the solution was successful in helping you solve your problem and reach your goal, then you know that you have effectively solved your problem. If you feel dissatisfied with the result, then you can begin the steps again. Viewing problem solving as a cycle may help you recognise

that problem solving is a way of searching for a solution which will lead to different possible solutions, which you can evaluate. If you have solved the problem you have found an effective solution. If you judge the problem has not been solved you can look for, and try, alternative possibilities by beginning the problem solving cycle again.

When to use problem solving

You can problem solve anytime you have a problem to solve or a goal to achieve. You can use the problem solving model to look for solutions to issues connected with your study, relationships, work or sport. You can take the problem solving steps by yourself, with a friend, or in a group. Problem solving with others is often very effective because you have access to a wide variety of viewpoints and potential solutions. The problem solving model is a useful resource for you to utilise in your personal, academic and professional lives.

Problem solving is a skill and a process which you can learn. You can implement the process to help you solve a problem by following the seven steps outlined in this Learning Guide. Once you have learned the steps and begun to implement the process, problem solving will be a new skill which you have acquired and can be used at university, home and in the workplace.

Developing your problem solving skills

This key skill assessment unit offers the student an opportunity to select and prepare work that demonstrates your key skills in the area of problem solving. This unit provides the student with advice and information on how to go about presenting key skills work as a portfolio. In presenting work that demonstrates key skills the student are expected to take the initiative in showing how to develop and improve a particular set of skills, and are able to use such skills more generally in their studies or at work. Skills development is all about taking responsibility for extending and improving learning and performance in a wide range of contexts. It is hoped, therefore, that the student will see the guide as a way of supporting learning and skills

development while studying, working and in other activities. However it is hoped that the problem solving skills will help make skills development something personally value.

The main goal of this module is to introduce learners to the most important concept in entails:

- defined the concept of problem solving
- described the difference between well-structured and ill-structured problems
- summarized the reasons why problem-solving skills are valuable
- explained the difference between the scientific method and problem solving
- demonstrated how to determine the true problem in any problem-solving situation

However, some choices are challenging and take careful thought and consideration. When one is confronted with these types of decisions, it can be very difficult to decide on the best option, and may be plagued by indecision. Situation may force one to choose between two equally good options, or perhaps, may have to pick between two choices that both have drawbacks. One may waver back and forth between different alternatives and may feel paralyzed to make the decision. This is a very normal reaction to tough choices in our lives, and at times, experiences a sense of being unable to decide on some option. However, researchers have developed a technique that many people have found useful when they are trying to make a difficult decision or solve a problem that seems unsolvable. This procedure involves a series of steps that can go through when confronted with a decision or problem that needs to be solved. This approach may not work perfectly for all difficulties, but it may help with many of the problems confronted with in daily life.

2.3 Review of Related Empirical Studies

Fafunwa (2011) sought to determine the skills and experiences deemed necessary for agribusiness graduates in Pennsylvania. The authors focused on agribusiness employees and university agribusiness students who attended a workshop. Their findings revealed that students and employees of agribusiness agreed that the skills listed were more important than their ability to perform those skills.

However, the groups differed in their perception of real-world skills and experiences needed to be successful. While students perceived internships to be vital to the success of their future employment, employees disagreed. Interestingly, students rated all skills (interpersonal, communication, technical, computer, and business and economic) as being more important than did employees. In addition, students felt more assured of their ability to perform interpersonal and communication skills than did employer.

Conclusions from the study revealed that employers suggested that communication skills would become increasingly more important over time. In addition, the ability to listen and speak clearly was determined to be two of the most important aspects of communication skills.

Graham (2001) conducted a three-year study to determine the preparation of entry-level agriculture graduates for employment as perceived by employers. The findings of this study implied that employers placed a strong emphasis on the skill areas of teamwork, leadership, dedication, and initiation. In terms of communication skills, employers rated listening as the most important. Character traits such as honesty, dependability, and integrity were also valued by the employers in this study.

Obi (2002) conducted a study "communication skills needed by university graduates employees for successful job performance in business organizations" and found that employees differed on their rating of the importance of writing, speaking, reading, and listening skills

required by university graduates employees for successful job performance, but not significantly. The study concluded that university graduates employees were perceived deficient in all the four clusters of communication skills. The study recommended among others that the universities should be better equipped to teach communication skills as a separate course to produce better quality employees for the ever-changing business world. The skills according to her can also be taught under General Studies Use of English course.

Robinson (2006) in his research study sought to find out the graduates' and employers' perceptions of entry-level employability skills needed by agriculture, food and natural resources graduates. The study was carried out at the University of Missouri-Columbia comprising the population of 365 respondents (290 graduates and 75 employers). 67 skills identified by the researcher were deemed important at the workplace but with discrepancy in the priority in the importance of the skills. While the graduates perceived problem-solving skills followed by motivation as the most important, the employers perceived working with others and time management as most important skills needed.

Many studies related to this study have been consulted and some of them reported in this research. In any case, the studies carried out by Fafunwa (2011), Andelt, Berrett and Bosshamer (1997), Graham (2001), Litzenberg and Schneider (1987), Obi (2002) and Robinson (2006) are very important and were also reviewed in the course of this study. Their significance lies in the fact that the framework for this study was derived in part from the information presented in those studies.

These studies helpfully guided the construction of this study; however, they are not similar. Fafunwa (2011), Andelt, Berrett and Bosshamer (1997), Graham (2001), Litzenberg and Schneider (1987) and Robinson (2006) all conducted their study on needed skills and competences needed by employers or in the workplace using agricultural and agricultural

related university graduates. Obi (2002) study was conducted using business education university graduates as respondents. The present study will attempt to identify the work skills needs of fabrication and welding craftsmen as perceived by related industries.

2.4 Summary of the Literature Reviewed

The society is experiencing a transformation or changing process which is affecting all spheres of our lives (economic, social, political etc,). This transformation is caused by the combined forces of globalization and rapid technological change, particularly innovations in information technologies. The workplaces are greatly affected by this transformation and in other to be relevant have continued to focus on adaptation, cost reduction, increased productivity and new markets and/or new products and services. The transformation in the workplace requires for employees especially the fabrication and welding craftsmen to be able to support increased competitiveness, innovation, flexibility and client focus. In order to fully support this increased competitiveness, innovation, flexibility and client focus in the modern workplace, craftsmen employability play an important role for them to meet up with the standard of job modification. While there is no singular definition of employability, a review of literature suggests that the work skill is about work and the ability to be employed; that is:

- the ability to gain initial employment; hence the interest in ensuring that 'key skills', careers advice and an understanding about the world of work are embedded in the educational system;
- the ability to maintain employment and make 'transitions' between jobs and roles within the same organisation to meet new job requirements, and;
- the ability to obtain new employment if required, that is, to be independent in the labour market by willing and able to manage their own employment transitions between and within organisations.

Craftsmen needed to obtain the required skills for them to fit into the workplace. Skills required are grouped into two namely technical skills (job-specific skills) and non-technical skills (employability skills). The literature reviewed work skills as problem solving, communication skills, team work skill and critical thinking skills are required not only to gain employment, but to progress within an enterprise so as to achieve one's potential and contribute successfully to enterprise strategic directions. It was also reviewed as transferable work skill groups that represent essential functional and enabling knowledge, skills and attitudes required by the 21st century workplace necessary for career success at all levels of employment and for all levels of education.

The literature also reviewed different bodies' views on the issue of work skills giving various skills requirement as what skills entail. The bodies include the Australian Council of Educational Research, the Secretary's Commission on Achieving Necessary Skills and the Conference Board of Canada. In was as reviewed that higher institutions are in charge of equipping the graduate with the necessary work skills needed to be successful in the workplace.

From the literature reviewed, however, it was discovered that little or no attention have been given to the work skills needed or required by the fabrication and welding graduates in the technical colleges for successful participation and integration into the modern workplace. Literature reviewed however did not reveal any empirical studies ever carried out to determine work skill needs of fabrication and welding craftsmen for effective performance on the job for successful participation and integration into modern workplace.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Design of the Study

The survey research design was used for the study. Survey research design enables one to obtain information from people who are considered to be representative of the entire population (Nwachukwu, 2012). In the same vein Gall, Gall and Borg (2003) also stated that survey research method uses questionnaire or interview to collect data from a sample that has been selected to represent a population to which the finding of the data analysis can be generalized. The design was considered suitable since this study solicited information from Industrial supervisor on the task and needs analysis of welding and fabrication practices in minna metropolis, niger state through the use of structured questionnaire.

3.2 Area of the Study

The study was conducted in Minna metropolis, Niger state of Nigeria. Minna is a city in Middle Belt Nigeria. It is the capital city of Niger State, one of Nigeria's 36 federal states. It consists of two major ethnic groups: the Gbagyi and the Nupe.

3.3 Population of the Study

The population of the study consists of two groups, group one comprised of 87 fabrication and welding teachers in the colleges and 19 secondary schools in the state offering fabrication and welding subject. The second group comprised of 12 Industrial fabrication and welding supervisor and 96 fabrications and welding craftsmen registered with the Niger state Ministry of labour and productivity. There was no sampling as the population 183 respondents are not large, accessible and manageable.

3.4 Instrument for Data Collection

The instrument for data collection was a structured questionnaire. The questionnaire contained items organized into five sections “A”, “B”, “C”, “D” and “E”. Section A contains items designed to obtain personal information of the respondents. The items have options and blank spaces to enable the respondents tick as appropriate. Section “B” contain items designed to find out the problem solving skill required by fabrication and welding craftsmen as perceived by related Industries. Section “C” centred on the communication skill of fabrication and welding craftsmen as perceived by related industries. Section “D” dwelled on items designed to find out the self management skill of fabrication and welding craftsmen as perceived by related industries.

Section “E” contain items aimed at finding out the critical thinking skill of fabrication and welding craftsmen as perceived by related industries.

The questionnaire items were formulated based on a five point Likert scale. The response categories for sections “B” to “E” are Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). These response categories are assigned numerical values of 5, 4, 3, 2, and 1 respectively. The respondents were required to check (√) against the response category that best satisfy their opinion.

3.5 Validation of the Instrument

The instrument was subjected to face and content validation by five experts, two from the Department of Industrial and Technology Education, Federal University of Technology Minna and three expert from welding and fabrication industries in Niger State. Validation according to Undechukwu (2014) is carried out to ascertain the appropriateness of the questionnaire items while Ary, Jacob and Razavieh (2002) explained that validity ensures that the questionnaire is appealing to the eye and that it appears valid for its intended purpose. Each validation were

served with a copy of the questionnaire and requested to identify ambiguities and proffer suggestions for improving the instrument towards meeting the objectives of the study. The experts' suggestions were taken into consideration in the final draft of the questionnaire.

3.6 Reliability of the Instrument

In establish the reliability of the instrument, the instrument were trial tested on 10 Technical teachers and 20 fabrication and welding Industrial supervisor which was not part of the respondents used for this study. Reliability according to Ary, Jacob and Razavieh (2002) indicates the extent to which data are free from errors but capitulate consistent results. Cronbach Alpha formula was used to determine the internal consistency of the instrument. The reliability coefficient computed for the Fabrication and Welding Instrument (FAI) was found to be 0.91.

3.7 Method of Data Collection

The researcher personally administered copies of the questionnaire to the respondents with the help of five research assistants. The research assistants were trained by the researcher on how to administer the instrument so as to ensure appropriate administration, safe handling and high return rate of the instrument. Each of the research assistants will be assigned to each technical college while the researcher will covered the last one and the industries.

3.8 Method of Data Analysis

The data generated from the use of the questionnaire was analyzed with the use of Statistical Package for Social Sciences (SPSS). Mean and standard deviation was used to answer each of the four research questions. The lower limit of agree is 3.50 any item with the Mean of 3.50 and above was considered as required.

CHAPTER FOUR

4.0 PRESENTATION AND ANALYSIS OF DATA

This chapter presented and analyzed the data collected for this study. Data for this study were analyzed using the statistical package for Social Science (SPSS) computer programme. The presentation and analysis is done in tables and figures and arranged according to the research questions and hypotheses formulated for the study.

4.1 Research Question 1

What are the problem solving skills required by fabrication and welding craftsmen as perceived by related industries?

Table 4.1: Mean and Standard Deviation of the Responses of the Respondents on the Problem Solving Skill Required by Fabrication and Welding Craftsmen as Perceived by Related Industries.

S/N	Items	X	SD	Remarks
1	Craftmen should be able prepared to invest time and effort in learning new skills	5.00	.680	Agreed
2	Craftsmen should be able to monitor and evaluate their own performance to succeed in the industry	4.00	.740	Agreed
3	Craftsmen should be able to take responsibility of their own action to participate successfully with the industry	3.51	1.020	Agreed
4	Craftmen should be able to think and reason well	4.78	.500	Agreed
5	Craftmen should be able to manage and handle matters	3.70	.800	Agreed

The analysis presented in table 4.1 indicates that all the item with mean score of 3.51 – 5.00 was agreed by the respondents that the items presented on research question one are the problem solving skill required by fabrication and welding craftsmen as perceived by related industries.

4.2 Research Question 2

What are the communication skills required by fabrication and welding craftsmen as perceived by related industries?

Table 4.2: Mean and Standard Deviation of the Responses of the Respondents on the problem solving skill required by fabrication and welding craftsmen as perceived by related industries

S/N	Items	X	SD	Remarks
1	Craftmen should produce an item based on its qualification	5.00	.501	Agreed
2	Craftmen should be able to weld without welding defect	4.06	.622	Agreed
3	To meet customers need through the use of relevant tools	3.90	.825	Agreed
4	Fabrication with the right tool	4.78	.935	Agreed
5	Produce a quality product	4.10	.914	Agreed
6	Follow the necessary precautions during welding operations	4.61	.488	Agreed

With regard to the items that consisted research question 2 as evidenced from Table 4.2 the results clearly showed that fifteen items fall within the acceptance mean range of 3.90 and .501. This was interpreted to mean that all the respondents, technical teachers (fabrication and welding) and industrial craftsmen agreed to 6 items in this section as the needed communication skill required by fabrication and welding craftsmen.

4.3 Research Question 3

What are the management skills required by fabrication and welding craftsmen as perceived by related industries.

Table 4.3: Mean and Standard Deviation of the Responses of the Respondents on the Self Management Skill Required by Fabrication and Welding Craftsmen as Perceived by Related Industries.

S/N	Items	X	SD	Remarks
1	Create an awareness for self reliance	4.00	.668	Agreed
2	Provide employment among the society	3.98	.738	Agreed
3	To take advantage of some relevant materials	4.50	.800	Agreed
4	Promoting creativity among metal workers	4.45	.500	Agreed
5	Construction of modern tools and equipments	3.68	.800	Agreed
6	Use and maintain specialized welding machines and equipment	4.30	.800	Agreed
7	Welding & fabrication machine that are reliable	3.38	1.161	Agreed

With regard to the items that constituted research question three as evidenced from Table 4.3 the results clearly showed that all the seven items (1-7) fall within the acceptance mean range of 3.38 and 4.67 above. This was interpreted to mean that all the respondents, agreed on all the 7 items in this section are self management skill required by fabrication and welding craftsmen.

4.4 Research Question 4

What are the critical thinking skills required by fabrication and welding craftsmen as perceived by related industries?

Table 4.4: Mean and Standard Deviation of the Responses of the Respondents on the Critical Thinking Skill Required by Fabrication and Welding Craftsmen as Perceived by Related Industries

S/N	Items	X	SD	Remarks
1	Produce an item based on its specifications	4.16	.763	Agreed
2	Fabricating with the right tools	4.39	.487	Agreed
3	Knowledge of relevant tools	4.46	.497	Agreed
4	Monitor stages of welding process	4.61	.487	Agreed
5	Study and interpret blueprints and measurements	4.39	.487	Agreed
6	Assess the quality of welds and identify flaws	4.55	.498	Agreed
7	Weld components without defects	3.51	1.015	Agreed
8	Prepare metals for easy welding/fabrication	4.07	1.022	Agreed
9	Prepare various joints used in welding	3.74	.989	Agreed
10	Prepare fillet weld joint perfectly	4.23	.708	Agreed

With reference to the items that addressed research question 4 as evidenced in Table 4.4, the results clearly showed that all the fifteen items (1-10) fall within the acceptance mean range of 3.51 and 4.84. This was interpreted to mean that all the respondents, agreed on the critical thinking skill required by fabrication and welding craftsmen.

4.5 Hypothesis One

There is no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries.

Table 4.5: The t-test analysis of the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries.

S/N	Items	X_1	X_2	SD_1	SD_2	t-cal	Remarks
1	Craftmen should be able prepared to invest time and effort in learning new skills	3.90	3.80	.560	.54	.280	NS
2	Craftsmen should be able to monitor and evaluate their own performance to succeed in the industry	3.97	3.86	.570	.57	.186	NS
3	Craftsmen should be able to take responsibility of their own action to participate successfully with the industry	3.95	3.80	.570	.58	.065	NS
4	Craftmen should be able to think and reason well	3.98	3.94	.455	.49	.576	NS
5	Craftmen should be able to manage and handle matters	3.90	3.86	.45	.40	.172	NS

Key: df= Degree of freedom = $N_1 + N_2 – 2 = 87 + 96 – 2 = 181$; **t-cal** = t- calculated. **Rmk** = mark

X_1 = 87, population of Craftsmen supervisor, **SD_1** = standard deviation of Craftsmen supervisor

$\mathbf{X_2}$ =96, population of Craftsmen $\mathbf{SD_2}$ = standard deviation of Craftsmen

Table 4.5 shows the data analysis of t-test on industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries. The calculated t-test value was less than the critical table values t for items 1-5 at 0.05 level of significance. The null hypothesis was accepted and the alternative hypothesis was rejected. It was therefore concluded that, there was no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries.

4.6 Hypothesis Two

There is no significant difference in the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries.

Table 4.6: The t-test analysis of the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries.

S/N	Items	X_1	X_2	SD_1	SD_2	t-cal	Remarks
1	Craftmen should produce an item based on its qualification	4.74	4.69	0.48	.46	.340	NS
2	Craftmen should be able to weld without welding defect	4.30	4.20	.53	.47	.563	NS
3	To meet customers need through the use of relevant tools	4.27	4.15	.48	.50	.069	NS
4	Fabrication with the right tool	4.25	4.11	55	51	.200	NS
5	Produce a quality product	4.20	4.49	..61	53	.256	NS
6	Follow the necessary precautions during welding operations	4.50	4.36	.638	.54	.006	NS

Key: df= Degree of freedom = $N_1 + N_2 - 2 = 87 + 96 - 2 = 181$; **t-cal** = t- calculated. **Rmk** = mark

$\mathbf{X_1}$ = 87, population of Craftsmen supervisor, $\mathbf{SD_1}$ = standard deviation of Craftsmen supervisor

$\mathbf{X_2}$ =96, population of Craftsmen $\mathbf{SD_2}$ = standard deviation of Craftsmen

Table 4.6 shows the data analysis of t-test on the communication skill of fabrication and welding craftsmen as perceived by related industries. It was observed that, the t-calculated value for the items 1-6 were less than the t-tabulated at 0.05 level of significance. Therefore the null hypothesis was upheld, hence it was concluded that, there was no significance difference between the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries.

4.7 Hypothesis Three

There is no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen.

Table 4.7: The t-test analysis of the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen.

S/N	Items	X_1	X_2	SD_1	SD_2	t-cal	Remarks
1	Create an awareness for self reliance	3.89	3.84	.52	.46	.481	NS
2	Provide employment among the society	3.88	3.82	.47	.57	.323	NS
3	To take advantage of some relevant materials	3.90	3.88	.46	.63	.747	NS
4	Promoting creativity among metal workers	3.91	3.91	.46	.60	.978	NS
5	Construction of modern tools and equipments	3.96	3.90	.51	.62	.417	NS
6	Use and maintain specialized welding machines and equipment	3.71	3.91	.55	.51	0.19	NS
7	Welding & fabrication machine that are reliable	3.72	3.98	.50	.35	00.1	NS

Key: df= Degree of freedom = $N_1 + N_2 - 2 = 87 + 96 - 2 = 181$; **t-cal** = t- calculated. **Rmk** = mark

$\mathbf{X_1}$ = 87, population of Craftsmen supervisor, $\mathbf{SD_1}$ = standard deviation of Craftsmen supervisor

$\mathbf{X_2}$ =96, population of Craftsmen $\mathbf{SD_2}$ = standard deviation of Craftsmen

Based on the data presented in table 4.7 above, it was observed that, the t-test calculated value for all the items listed on the table on the management skill needed by welding and fabrication craftsmen were less than the table value for the items at 0.05 level of significance. Therefore the null hypothesis was upheld for the listed items, hence it was concluded that, there was no significant difference between the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen.

4.8 Hypothesis Four

There is no significance difference in the mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries.

Table 4.8: The t-test analysis of the mean responses of industrial supervisor and craftsmen on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries.

S/N	Items	X_1	X_2	SD_1	SD_2	t-cal	Remarks
1	Produce an item based on its specifications	4.05	4.12	.98	.66	.978	NS
2	Fabricating with the right tools	4.01	4.02	.86	.74	.439	NS
3	Knowledge of relevant tools	3.95	3.97	.72	.53	.605	NS
4	Monitor stages of welding process	3.94	3.93	.71	.39	.848	NS
5	Study and interpret blueprints and measurements	3.89	3.95	.46	.40	.598	NS
6	Assess the quality of welds and identify flaws	3.89	3.95	.71	.40	.600	NS
7	Weld components without defects	4.00	3.98	.65	.54	.659	NS
8	Prepare metals for easy welding/fabrication	4.18	4.42	.59	.50	.638	NS
9	Prepare various joints used in welding	3.99	4.09	.66	.34	.830	NS
10	Prepare fillet weld joint perfectly	4.13	4.14	.73	.64	.914	NS

Key: df= Degree of freedom = $N_1 + N_2 - 2 = 87 + 96 - 2 = 181$; **t-cal** = t- calculated. **Rmk** = mark

$\mathbf{X_1}$ = 87, population of Craftsmen supervisor, $\mathbf{SD_1}$ = standard deviation of Craftsmen supervisor

$\mathbf{X_2}$ =96, population of Craftsmen $\mathbf{SD_2}$ = standard deviation of Craftsmen

Table 4.8 above shows the data analysis of t-test on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries. The calculated t-test value was less than the critical table values t for items 1-10 at 0.05 level of significance. The null hypothesis was accepted and the alternative hypothesis was rejected. It was therefore concluded that, there was no significant difference between the mean responses of qualified and less qualified industrial worker on the critical thinking skills needed by fabrication and welding craftsmen as perceived by related industries.

4.9 Findings of the Study

This section of the study is intended to report the research findings based on the research questions and hypotheses formulated to guide the study. This presentation is as found below.

Research question one presented twenty five items on the various types of problem solving skills required of a fabrication and welding craftsmen as perceived by related industries. The analysis of the respondents' responses agreed to all the items that fabrication and welding craftsmen should:

1. Craftmen should be able prepared to invest time and effort in learning new skills
2. Craftsmen should be able to monitor and evaluate their own performance to succeed in the industry
3. Craftsmen should be able to take responsibility of their own action to participate successfully with the industry
4. Craftmen should be able to think and reason well
5. Craftmen should be able to manage and handle matters

Research question two presented fifteen items on the various types of communication skills required of a fabrication and welding craftsmen as perceived by related industries. The analysis of the respondents' responses agreed that fabrication and welding craftsmen should:

1. Craftmen should produce an item based on its qualification

2. Craftmen should be able to weld without welding defect
3. To meet customers need through the use of relevant tools
4. Fabrication with the right tool
5. Produce a quality product
6. Follow the necessary precautions during welding operations

Research question three outlined twenty items on the various types of management skills required of a fabrication and welding craftsmen as perceived by related industries. The analysis of the respondents' responses agreed to all the items that Fabrication and welding craftsmen should:

1. Create an awareness for self reliance
2. Provide employment among the society
3. To take advantage of some relevant materials
4. Promoting creativity among metal workers
5. Construction of modern tools and equipments
6. Use and maintain specialized welding machines and equipment
7. Welding & fabrication machine that are reliable

Research question four outlined twenty items on the various types of critical thinking skills required of a fabrication and welding craftsmen as perceived by related industries. The analysis of the respondents' responses agreed to all the items that Fabrication and welding craftsmen should:

1. Produce an item based on its specifications
2. Fabricating with the right tools
3. Knowledge of relevant tools
4. Monitor stages of welding process
5. Study and interpret blueprints and measurements

6. Assess the quality of welds and identify flaws
7. Weld components without defects
8. Prepare metals for easy welding/fabrication
9. Prepare various joints used in welding
10. Prepare fillet weld joint perfectly

4.10 Research hypothesis 1

There was no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries.

4.11 Research hypothesis 2

There was no significant difference in the mean responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen as perceived by related industries.

4.12 Research hypothesis 3

There was no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen.

4.13 Research hypothesis 4

There was no significance difference in the mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries.

4.14 Discussion of Findings

The data presented in Table 4.1 provided answer to research question one, findings revealed that the items listed as problem solving skills required by fabrication and welding craftsmen as perceived by related industries had high mean score. Thus, indicating the acceptance of the respondents. In the same vein, the t-test analysis result on hypothesis one presented in Table

4.6 confirmed that there is no difference between the mean response of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding as perceived by related industries. The insignificant difference is attributed to the calculated t-test result is less than the table value at a significant level of 0.5. This finding indicated that there was no significant difference in the mean responses of industrial supervisor and craftsmen on the problems solving skill required of fabrication and welding craftsmen as perceived by related industries. It could be inferred that, the problem solving skill is an important skill needed to be possessed by of fabrication and welding craftsmen. This finding is similar to the finding of Becker and Maunsaiyat (2004), who in their study found out that the problem solving skill is a requisite skill needed by fabrication and welding craftsmen in the industry and thus call for the students improvement in the skill for a positive students' achievement in fabrication and welding industry.

The data presented in Table 4.2 provided answer to research question two. Findings revealed with a high mean score that the communication skills are required by fabrication and welding craftsmen. Also, t-test analysis on the respondents' responses of industrial supervisor and craftsmen on the communication skill of fabrication and welding craftsmen confirmed that there is no significant of the respondents. This showed that the communication skill will have positive effect on the students' preparation for the world of work. These findings may have stemmed from the fact that communication skill enhances hands-on activities which places learning in the hands of the students. The provision of active learning environment where students can be engaged and participate actively in class discussions increase the students' ability to explore issues and articulate their own ideas. Also, the use of open ended questions by the teacher makes the students to engage in higher order thinking task such as analysis, synthesis and evaluation. These consequently improve students' communication skill and cognitive achievement needed for application in industrial work. This affirms Tochonites

(2000) and Bonwel and Elson's (2003) views that active learning approach facilitate active communication and aid knowledge construction, develops higher order thinking skills, improves memory and enhance transfer of learning to other situation. Von Glasersfield (2001) was of the opinion that by teaching students to think, they will gradually begin to realize that conscious reflection secretes understanding. He maintained that when students learn to think, they will be able to communicate all sort of new problem creatively and will have acquired some confidence

In any educational practices, when students work or learn in groups collaboratively using real object, each person, in order to be an effective participant, will need to think critically in order to make logical contributions. Moreover, when students learn in groups, the bright ones always help the dull ones to understand the subject matter being learnt. This affirms Ngeow (1998) and Lazurus (1999) view that communication skill enhances critical thinking skills and hence, cognitive achievement and retention of learning.

The analysis of the result of management skills presented in Table 3 which provided answer to research question three showed that fabrication and welding craftsmen, respondents to all items with high mean score. The analysis of the t-test presented in Table 8 confirmed that there is no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen. These findings indicated that the self management skill has a positive effect on welding and fabrication craftsmen psychomotor achievement in the industry. This finding may be attributed to the fact that students taught self management skill approach engaged in an authentic task in an authentic environment using real objects such as tools and machines. There has been a great deal written about authentic activities in recent times. According to Reeves, Herrington and Oliver (2002) self management skill entails authentic activities, this which is anything students are expected to do, beyond getting input through reading or listening, in order to learn, practice, apply,

evaluate, or in any other way respond to curricular content' Similarly, Lockwood (1992) stated that authentic activities 'encourage and affirm learning but essentially, they encourage the learner to respond to the classroom teaching and learning rather than remain passive, this helps the fabrication and welding craftsmen to function effectively in the industry.

The critical thinking skills presented on Table 4.4 showed that with reference to the items that addressed research question 4 as evidenced in Table 4, the results clearly showed that all the ten items (1-10) fall within the acceptance mean range of 3.51 and 4.84. This was interpreted to mean that all the respondents, agreed on the critical thinking skill required by fabrication and welding craftsmen. The null hypothesis on the mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries was accepted. This means that there was no significant difference between the mean score qualified and less qualified industrial worker. Although, the mean score of qualified industrial worker was found to be slightly higher than that of the less qualified industrial worker as shown in Table 4.9, but the difference was not high enough to be significant. The superiority of the mean score of qualified industrial worker over that of less qualified industrial worker could be explained by the fact that qualified qualified industrial worker are better use to experience acquire on the job.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the following: re-statement of the problem of the study, summary of the procedures adopted and the major findings of this study. It also presents the conclusion, recommendations and suggestions for further research.

5.1 Conclusions

This study set out to determine work skill needs of fabrication and welding craftsmen as perceived by related industries in Kaduna State. In the conduct of the study, the study took into consideration problem solving skill required by fabrication and welding craftsmen as perceived by related industries, communication skill required by fabrication and welding craftsmen as perceived by related industries, self management skill required by fabrication and welding craftsmen as perceived by related industries and critical thinking skill required by fabrication and welding craftsmen as perceived by related industries. The study found out that problem solving skills are required of a fabrication and welding craftsmen as perceived by related industries, the study found that communication skills are required of a fabrication and welding craftsmen as perceived by related industries, it was also found out that management skill are required of a fabrication and welding craftsmen as perceived by related industries, critical thinking skills are required of a fabrication and welding craftsmen as perceived by related industries.

The study found out no significant difference in the mean responses of industrial supervisor and craftsmen on the problem solving skill required of fabrication and welding craftsmen as perceived by related industries, it was also found out there was no significant difference in the mean responses of industrial supervisor and craftsmen on self management skill needed by welding and fabrication craftsmen. Also it is found that there no significance difference in the

mean responses of qualified and less qualified industrial worker on the critical thinking skill needed by fabrication and welding craftsmen as perceived by related industries.

The study will therefore give craftsmen the opportunity to develop valuable thinking skills and acquire an understanding about the technological world. Since, the work skill needs reflects modern industry practices, it will thus aid craftsmen with the learnable tool for creative visualization. It is hoped that if work skill needs is taken into consideration in the fabrication and welding craftsmen, the craftsmen produced by the technical colleges will graduate with requisite fabrication and welding skills needed become for self reliance in the world of work.

5.2 Recommendations

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

1. The technical teachers and the supervisors agree on the skills never acquired and which was required in the industries based on new trend in world of work, this shows that there is need for these skill to be introduced to the technical college curriculum. The National Board for Technical Education (NBTE), in collaboration with experts from industries and Government organization should review the current curriculum for technical institution programmes in line with the new skills emerging from the industries.
2. Technical institutions and industries should jointly collaborate in skills acquisition in other to remedy the deficiencies of skills not acquired by students in technical institutions.
3. The students on entry into fabrication and welding craft practice in technical colleges should be guided to select two or three occupational skill areas in which they should be effectively trained. They should be given opportunities to acquire practical experiences in real work situations with regard to the occupational areas they are being trained for this could lead them to self employment if not employed

4. A close association between the technical teachers of the department of fabrication and welding craft practice in technical colleges and the industries, who are the consumers of the products of these institution graduates, should be maintained at all time. This link will enable the schools to take cognizance of technological changes happening in the world of work and articulate a modification curriculum that meets the needs of the society and industrial manpower of the country.

5. Federal Government should wade in, to facilitate co-operation between technical colleges and the industries to work out programmes for the overall educational development of young Nigeria, in the area of these soft skills.

5.3 Suggestions for Further Research

The following have been suggested for further investigation:

1. Technical skills needed by welding and fabrication craftsmen as perceived by the industry.
2. This research work could be used or carried out in other part of the country.
3. Industry-based skill competencies required of graduates of tertiary technical institution for employment in welding and fabrication related Industries in Nigeria.

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APPENDIX

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

QUESTIONNAIRES ON TASKS AND NEEDS ANALYSIS OF WELDING AND FABRICATION PRACTICES IN MINNA METROPOLIS, NIGER STATE

SECTION A

Please complete the following by ticking (√) or filling the spaces provided

Personal Data:

1. Position held:

   Technical Teacher ( ) Craftsmen ( )

2. Sex:

   Male ( ) Female ( )

Please complete the questionnaire by ticking to the following items using the keyword provided below;

KEYWORDS:

Strongly Agree (SA)

Agree (A)

Disagree (D)

Strongly Disagree (SD)

SECTION B

What are the problem solving skills required by fabrication and welding craftsmen

S/N	ITEMS	SA	A	D	SD
1.	Craftmen should be able prepared to invest time and effort in learning new skills				
2.	Craftsmen should be able to monitor and evaluate their own performance to succeed in the industry				
3.	Craftsmen should be able to take responsibility of their own action to participate successfully with the industry				

4.	Craftmen should be able to think and reason well				
5.	Craftmen should be able to manage and handle matters				

SECTION C

What are the competencies required by fabrication and welding craftsmen ?

S/N	ITEMS	SA	A	SD	D
1.	Craftmen should produce an item based on its qualification				
2.	Craftsmen should be able to weld without welding defects.				
3.	To meet customers need though the use of relevant tools				
4.	Fabrication with the right tool				
5.	Produce a quality product				
6.	Follow the necessary precautions during welding operations				

SECTION D

What are the needs of fabrication and welding craftsmen

S/N	ITEMS				
1	Create an awareness for self reliance				
2.	Provide employment among the society				
3.	To take advantage of some relevant materials				
4.	Promoting creativity among metal workers				
5.	Construction of modern tools and equipments				
6.	Use and maintain specialized welding machines and equipment				
7.	Welding & fabrication machine that are reliable				

SECTION E

What are the tasks of fabrication and welding craftsmen?

S/N	ITEMS	SA	A	SD	D
1	Produce an item based on its specifications				
2	Fabricating with the right tools				
3	Knowledge of relevant tools				
4	Monitor stages of welding process				
5	Study and interpret blueprints and measurements				
6	Assess the quality of welds and identify flaws				
7	Weld components without defects				
8	Prepare metals for easy welding/fabrication				
9	Prepare various joints used in welding				
10	Prepare fillet weld joint perfectly				