INDUSTRIAL SAFETY SKILLS NEEDED BY TECHNICAL COLLEGE MOTOR VEHICLE MECHANIC STUDENTS FOR EFFECTIVE MAINTENANCE OF AUTOMOBILES IN NIGER STATE

BY

IBRAHIM Jibril Ibrahim
2018/3/74381TI

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

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A RESEARCH PROJECT SUBMITTED TO THE
DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION
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DECLARATION

I IBRAHIM, Jibril Ibrahim Matric No: 2018/3/74381TI 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.

IBRAHIM, Jibril Ibrahim	**Signature & Date**
2018/3/74381TI	

CERTIFICATION

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

Mr. Abutu Francis
Project Supervisor

Date & Date

Dr. T. M. Saba
Head of Department

Sign & Date

Prof. I. Y. Shehu
External Examiner

Sign & Date

DEDICATION

The researcher hereby dedicate this project work to his family, for their support and prayers.

ACKNOWLEDGEMENTS

All glory to Allah for His faithfulness, guidance, courage and sufficient grace bestowed upon me to undertake this research work. Special appreciation goes to my supervisor, Mr. Abutu Francis for his patience, support, thorough and meticulous supervision with the words of encouragement from the beginning till the end of this project work. May God Almighty grant all your heart desire.

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ABSTRACT

The research was design to investigate the industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger state. The study adopted descriptive survey research design the population of the study was 105 automobile workshop supervisor, motor vehicle mechanic teachers and automobile technology lecturers. The sampling techniques used for this study was purposive sampling technique. The sampling size was 60 automobile supervisor 25 motor vehicle mechanic teacher and 20 automobile technology lecturers. Five research question were answered Mean and standard deviation was used to answer the research questions while t-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study revealed that: that most of the safest ways of handling tools and equipment is just by using tools with a good handle, checking the sharpness of scribers, knowing the capacity of any tool before using it for any work Protecting hands with gloves and wearing safety shoes when operating portable tools and machines, Wear approved eye protector when operating a power tool, stop power tools or machines before cleaning activities or making any adjustment, switch off the socket outlet before power tools or machine is connected, Disconnect the power tool or machine immediately a strange sound is noticed is one of the safest ways of operating equipment and machines in the workshop in Niger state. This implies that when proper supervision, adequate training of teachers and students on safe practices in automobile maintenance operation, it will help to improve a safe working environment for our students in the workshop in Niger state. It was recommended that Safety skills should be included in the curriculum of automobile technology at technical college level, Workshop/seminars should be regularly organized for automobile technology teachers and automobile workshop supervisor to acquaint them with the safety skills required by MVM students for safe workshop practice and in automobile maintenance operation, The National Board for Technical Education (NBTE) should incorporate safety skill in the automobile technology curriculum as well as in the regulatory or quality assurance programme, Safety skills should be taught as a separate course or subject in automobile technology trade in technical colleges in Nigeria to give it the prime importance it deserves.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Industrial safety is of paramount concern to both workers and students. Students and even parents are much more interested in the level of safety provided in a particular occupation. Students who possess required safety skills would always fair better in an occupation, especially technical occupations. The knowledge of safety practice skills by motor vehicle mechanic (MVM) students in technical colleges is an essential prerequisite for effective use of tools and machines in the workshop. Skilled automobile worker is not just someone who can perform any automobile job correctly but a worker who can complete every job safely. Safety has become a major determinant for effective and successful performance in a job. (Oranu, 2017).

According to Olaitan (2016) safety is the art of taking precaution for the avoidance or reduction of accidents in order to protect people and property. Ogwo (2015) further viewed safety as the ability to perform every simple task involved in a job without causing damage to tools, equipment or materials used in performing the task. Safety practice is the ability to perform a task with necessary precautionary measures exhibited for the purpose of preventing accidents. Practice means doing something repeatedly in order to improve performance. For students to perform a task with little or no record of accidents in automobile workshop, certain related skills are required by them which includes handling of tools and equipment, operating equipment and machine, handling material and maintaining machines.

However, Okorie (2018) defined skill as a manual dexterity through repetitive performance of an operation. Skill is a well-established habit of doing something and it involves the acquisition of performance capabilities, Osinem (2018). This implies that skill involves well established habit of doing things. In this study, skill is the ability of MVM students in Technical colleges to establish good habit performance in the workshop by acting, thinking, and behaving well in order to prevent minor and major accidents that is involving in any operation or job that is related to automobile and maintenance work. One important essential activity in automobile workshop is safety of human beings and safety of the vehicle, Nwoke (2015). No nation can hope to develop and advance technologically without trained individuals with relevant skills, knowledge, attitudes and abilities required to form an efficient workforce in all sectors of her economies. With the emphasis lay on sound technical educational programme in Nigeria, Technical College are designed to prepare individuals to acquire practical skills, basic and scientific knowledge education, theory and related courses, workshop practice and attitude required as craftsmen and technicians at sub-professional levels. (Ekon, 2019).

Technical colleges according to Okoro (2019), are principal vocational institutions in Nigeria which are designed to prepare the individuals to acquire practical skills, knowledge and attitude at sub-professional level, they are also established to train craftsmen in various occupations. Okorie (2018) also saw technical college as institutions where craftsmen are trained up to obtain the craft certificate of West African Examination Council (WAEC) and advanced craft certificate. Students who have completed the first three years of secondary school education are eligible for admission into technical colleges. Technical colleges are therefore, schools or training institutions where trades are being taught(Igbo, 2021). It is imperative for technical colleges to take into cognizance the safety skills necessary in handling automobile equipment by students to

achieve the set objectives of the program. However, in this study, technical college is formal place of learning where theory and practical skills are learned by students from the teacher and instructor who give the instruction. Technical colleges are secondary institutions where individuals are trained to acquire skills knowledge and attitudes required for either self or paid employment. Technical colleges offer varieties of technical and vocational trades to include motor vehicle mechanic work (MVMW).

Olayinka (2019) explained that MVMW is designed to produce competent auto mechanics craftsmen for Nigeria technological and industrial development. The aim of motor vehicle mechanic work according to National Board for Technical Education (NBTE) (2016), is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. The students of MVM are called auto mechanic craftsmen and are expected to acquire necessary skills to test, diagnose, service and completely repair any fault on the motor vehicle to the manufacturers' specification. Fadairo (2015) stated that the components of MVMW are arranged in modules for easy assimilation by learners. These components include engine maintenance, suspension system, auto electricity and transmission reconditioning work, major engine repair works, service station mechanic, steering and braking system.

The role of technical college education in Nigeria include: provision of full time or part-time courses of instruction and training in technology, applied science and commerce, in such other field of applied learning, relevant to the needs of the development of Nigeria in the areas of industrial, commercial and vocational agriculture, professional studies in engineering and other technologies and perform such other functions as in the opinion of the society as may serve to promote the objectives of the technical colleges, Abdulkadir

(2017). They give full vocational training intended to prepare students for entry into the various occupations Okoye and Arimonu (2016). According to United Nations Educational, scientific and Cultural Organization and National Board for Technical Education, UNESCO & NBTE (2019) Contributed that the aim of Technical College's curriculum is to give training and impact the necessary skills leading to the production of craftsmen, technicians and other personnel who will be enterprising and self-reliant. In response to the above Okolocha (2016) showed that the range of courses in the technical colleges shall be as wide as possible to include among others: computer craft practice, building trades, wood trades, textile trades, printing trade, beauty culture trade and electrical engineering trades, and automobile trade.

Motor vehicle mechanic trade has been in a state of continuous development in response to society's needs and expectations. It continues to evolve today in line with contemporary requirements, not only as a vital element in global economic activity or as a means of commercial and passenger transport, but also as a means of enhancing people's live. Automobile mechanic is one of the trades in technical colleges. It is made up of the following components, auto engine; steering system; automotive transmission system and braking system, (NBTE 2016). According to Nwachukwu (2018) automobile mechanic trade is a vocational course offered by students in technical colleges in order to produce automobile craftsmen and technicians. MVM student is a person who is taking vocational course offered in technical colleges in order to become MVM craftsman. Nwachukwu (2018), MVM students learn the basic skills required to operate, maintain and repair automobile vehicles in technical colleges.

Motor vehicle mechanic programme provides a foundation for students to go directly to work, continue into post-secondary education to become an automobile service

technician or to study automobile engineering, design manufacturing, management in the automobile industry, automobile technologies or automobile educationalist (FRN 2015). Industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger State is not clearly establish in any existing literature. That is why it became paramount to seek the opinion of automobile technology teachers and automobile workshop supervisors. The automobile technology teachers in the context of this study, refers to all those personnel that are teaching automobile courses in technical colleges and higher institutions, since they both require the same minimum qualification of Bachelor's Degree in their careers. While, automobile workshop supervisors refers to skills work men that are fully trained and highly experience into the field of automobile maintenance practice. Therefore the study seek to investigate the industrial safety skills need by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger state, Nigeria.

1.2 Statement of the Research Problem

In the four NBTE accredited state government owned technical colleges in Niger state, the motor vehicle Mechanic students are prone to various forms of accidents. This is linked to the results of poor operational standard involved by students in technical college in carrying out safety measures during operations in the workshops. These operations include use of automotive hazardous tools and equipment, when operating machine and equipment in the workshop. Olaitan (2016) stated that the motor vehicle mechanic workshops in technical colleges had continually experienced series of accidents due to the negative and poor handling of mechanical tools and equipment, failure to put on safety apparatus when operating machines and equipment. Thus, for a perfect operation free of accident in the MVM workshop, the motor vehicle students need to posse safety practice

skills with the aim to prevent or totally eliminate the occurrence of accidents in technical colleges, which most times result to the death of students and equipment damaged among others.

Furthermore, Ogwo (2015) opined that students working on motor vehicles in the workshop often sustain injuries, damaged cars, tools and rendered electronic machines non-functional during practical works. These students are most times sub-charged for damages sustained to expensive cars, tools and electronic machine sat the end of workshop exercise. These have necessitated the anxiety of students to always obtain excuses with the intent to be absent from practical classes in the motor vehicle mechanic workshops, while others are left with the perception that motor vehicle mechanic practical exercises are risky and hazardous to human life.

However, it is common to believe that these various accidents had occurred due to negligence or failure of students to observe workshop safety rules and regulations. Igbo (2021) maintained that Motor vehicle students are not guided with safety instructions during practical exercises; hence, they are exposed to fire explosion and other health hazards. Igbo further noted that lack of adherence to safety rules in operating machines and equipment in motor vehicle mechanic workshop have rendered tools, machines and equipment ineffective. It is in the light of these that there is need to conduct a study on the industrial safety skills needed by technical college MVM students for effective maintenance of automobiles in Niger state to ensure safety of lives and properties.

1.3 Purpose of the Study

The purpose of this study is to assess the industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger State.

The specific objectives of the study are to identify:

1. Industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation.
2. Industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation.
3. Industrial safety skills needed by MVM students in handling materials in automobile maintenance operation.
4. Industrial safety skills needed by MVM students in overhauling of automobile engine.
5. Strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation.

1.4 Significance of the Study

The findings of the study will be of benefit to the MVM Teachers and automobile technology lecturers, Students, Government, and National Board for Technical Education (NBTE), the society, the parents, the researchers and workshop automobile workers.

MVM teachers in technical colleges and automobile technology lecturers shall benefit from the findings of this study, when published, see the need to improve the teaching of safety skills and to identify the materials needed for safety practice in MVM workshop. The skill required by automobile teachers identified in the study will expose their current deficiencies in teaching industrial safety in technical colleges. Such exposure will lead them to further training for skill acquisition which will eventually lead them to acquisition of the required skill in industrial safety, which would now qualify them in teaching safety skills in technical colleges with self-confidence and satisfaction.

The students will benefit from the findings of this study by receiving standard training on safety skills and the use of safety equipment which will in turn improve their safety and academic performance. The awareness from the findings of the study will help the students to identify the personal safety equipment and making good use of them. The findings would assist the students in their everyday handling and operation of equipment and tools in and outside the workshops. The study will also be useful to research students and research organizations since the research report will provide an important source of literature for further studies relative to the issue. MVM students will benefit from the findings of the study by having a sound teaching from their teachers who have now acquired the required skill in industrial safety and are teaching the needed skill that can be found in the automobile organizations outside class room. Finding jobs will no longer be problems because they (students) have now acquired the necessary competence and skills that can guarantee them employment.

These findings of this study will benefit the Government through Ministry of Education and Ministry of Science and Technology by using the information provided to come up with measures that will ensure effective supply of safety equipment and recruitment of qualified teachers. The government will also find it rewarding for providing people of the state with sound technical education and feeding MVM workshops with qualified and competent technicians who can be relied upon for credible maintenance and repairs of vehicles.

The findings of this study could be used by National Board for Technical Education (NBTE) as a quality control body to incorporate suitable programme that can enhance safety practice competencies in MVM profession. The information that would emanate from this study will stimulate similar research efforts in other states of the federation on

the practice of safety skills required in their institutions. The results may have far reaching implications for national development in general as new concepts would be discovered on safety skills. The findings of the study would provide information to researchers that may wish to carry out similar research in other field in the future.

The result of the study would help the workshop personnel/automobile workers to effectively guide themselves and the students when working on machine or making use of tools during practical works. Understanding the result of this study would also help the workshop personnel and workers to take adequate care of tools and equipment in the workshop by keeping them clean and placing them in their proper position in the work area.

The findings of the study will be of benefit to the society/parents at large, when competent MVM students practice safety in handling automobile equipment both at home and in the community. The findings shall benefit the society when skilled graduates of automobile technology practice and educate the public on safety measures to be taken when handling automobile equipment. Parents of MVM students will benefit from this study by having their children obtaining jobs after graduation thereby fulfilling their (parents) dream of having value for their long term investment in their children's education.

Curriculum designers will benefit from the findings of this study by using the findings and recommendations for designing instructional content that will be used for teaching industrial safety in technical colleges thereby imparting current and correct skills to the students. The findings will also provide a guide in key areas that will prevent waste of resources, time and energy thereby saving cost which is always the characteristic of designing new curriculum.

This study will be useful since it seeks to assess the industrial safety skills needed by technical college MVM students for effective maintenance of automobiles in Niger state. The research will be of great significance to preparation of a safety manual based on the findings of the study. The study will promote effective implementation of safety skills issues on MVM students in technical college in Niger state. It will draw the attention of the mechanics to the common challenges that keep emerging.

1.6 Scope of the Study

This study is delimited to the industrial safety skills needed by technical college motor vehicle mechanics students for effective maintenance of automobiles in Niger State, Nigeria. The study also covers the Industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation, Industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation, Industrial safety skills needed by MVM students in handling materials in automobile operation, Industrial safety skills needed by MVM students in overhauling of automobile engine and Strategy for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation.

This study encountered some limitations such as time factor which reduced the research processes due to the fact that, some technical colleges were scatted across Niger State in the sense that the researcher needed lot of time to visit and collect data for the study. The study also observed hardship in locating students and teachers working in the workshop so as to see how they observe the safety rules and regulations in the workshop. Some of the technical colleges in Niger State had very strict rules and long procedures to get permission for conducting a study; hence the researcher spent lot of time and money to get permission for collecting data.

1.6 Research Questions

The following research questions will guild the study:-

1. What are the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation?
2. What are the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation?
3. What are the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation?
4. What are the industrial safety skills needed by MVM students in overhauling of automobile engine?
5. What are the Strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation?

1.7 Hypotheses

The following null hypothesis was formulated and will be tested at 0.05 level of significance.

HO_1: There will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisors on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation.

HO_2: There will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisors on the industrial safety skills needed by MVM students in operating equipment and machine in automobile maintenance operation.

HO_3: There will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisors on the industrial safety skills needed by MVM students in handling.

HO_4: There will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisors on the industrial safety skills needed by MVM students in overhauling of automobile engine.

HO_5: there will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisors on the strategy for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

The related literature shall be reviewed under the following sub-heading

2.1 Conceptual framework of the study

2.4.1 Technical college education in Nigeria

2.4.2 Motor vehicle mechanic trade in technical colleges

2.4.3 Safety skills in motor vehicle mechanic trade

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2.5.1 Theory of skill acquisition

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2.5.3 Robert dekyser theory of skill acquisition

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2.6 Related Empirical Studies

2.7 Summary of Literature Reviewed

2.1 Conceptual Framework of the Study

Concept is a distinctive meaning of a term, word or phrase that symbolizes several ideas.Concept is a medium of organizing knowledge about the world to categorize information (Nnadi, 2019). Nnadi went further to state that a concept may mean tangible things such as chair, house, table, rock, stone, book, boy, girl, woman, man etc. Ekon (2019) stated that concept is an idea,thought or devolution of abstract system of thoughts, by which science investigates, interpretsand understands particular segments of reality or

phenomena. It is a distinctive meaning of aterm, that is, whatever is meant by word or phrase that symbolizes several interrelated ideaswhich may mean tangible things.

Framework according to Hornby (2019), is the structure of ideas and how they arearranged to give a functional meaning to an event. While conceptual framework as explained by Okonkwo (2020), involves the definitions of various terms associatedwith a particular study. However, conceptual framework, as used in the context of this studyinvolves the explanation of the new terminologies that are used in a special way for the purposeof the study. The concepts in this study include: skill improvement, automobile maintenance,technical college graduates, motor vehicle mechanic, safety skill in motor vehicle mechanic trade, strategies for improving safety skills in maintenance operation, problems associated with safety skill in maintenance operation, safety skills in maintenance operation. These concepts will be explained one after the other in order to substantiateand give meaning to the study thus:

2.1.1 Technical College Education in Nigeria

Technical college education is an aspect of education that deals with acquisition of practical skills in an attempt to produce technical man-power which can lead to self-reliance from the acquired skills in technical colleges. Federal Government of Nigeria FGN (2015), indicates that technology education is a programme through which practical and applied skill is acquired or obtained starting from technical college. Technical colleges are institutions that provide students with knowledge on skills manipulation to enable them use their brain and hands to produce objects.

In the view of Okoro (2019), technical college is a principal vocational institution in Nigeria, which is designed to prepare individuals to acquire practical skills, knowledge

and attitude required of technicians at sub-professional level. Ogbuanya and Osoro (2019) sees technical education as special training which help to qualify a person to engage in branches of productive industry. Ogbuanya and Osoro (2019) further stated that the specialized education may consist of the explanation of the processes in production or of instruction in art and science in its relation to industry but it may also include the acquisition of the manual skills which production necessitates.

In a related view Ogbuanya and Osoro (2019) defined vocational technical education and training as those learning activities designed to facilitate the acquisition of practical and applied skills and attitudes, which contribute to successful economic performance. Also Samuel (2020) viewed vocational and technical education as a multidisciplinary and pragmatic field of study, which is aimed at equipping the individuals with requisite vocational and technical education skills, which will enhance their relevance and functionality in the society.Technical Education may also be considered as a kind of education, knowledge or training which is available and accessible in technical colleges. Makama (2017), noted that the courses run by technical colleges are departmentalized to ensure that students are given training in specific trades for effective performance. Some of the trades in these colleges include electrical installation, electronics, metal work technology, auto mechanic technology, etc. which are practically oriented. FRN (2015), highlighted some electrical engineering trades being offered in technical colleges to include: electrical installation and maintenance work, radio, television and electrical work and appliances repairs. These trades/courses are being offered in order to produce technological minded individuals, who can use their brains and hands to manipulate things for meaningful development in the world of technology.

According to Umunadi (2019), Technical Colleges are principal vocational institutions in Nigeria which are designed to prepare the individuals to acquire practical skills, knowledge and attitudes at sub-professional level, primarily established to train craftsmen in various occupations. Okorie (2018), also sees Technical Colleges as institutions where craftsmen are trained up to the National Technical certificate (NTC) level issued by the National Business and Technical Examination Board (NABTEB). Students who have completed the junior secondary schools' education and the successful products of the vocational training centres arelegible for admission to Technical Colleges. Technical Colleges are therefore, schools or training institutions where trades are being taught. Technical colleges train craftsmen in several areas which include: Metal work practice; Fabrication and welding; electrical installation, Block laying and Concreting, Carpentry and joinery; and Furniture making. These activities are done in the workshops. Workshops play very important roles in technical colleges and workshop safety is of very serious concern to Technical Colleges. Practical works in the workshops require tools and techniques that are inherently dangerous. When working in the workshop it is important to protect the eyes, ears, and lungs, and to take great care when using hand and machine tools.

2.1.2 Motor Vehicle Mechanic Trade in Technical Colleges

Motor vehicle mechanics is one of the trades offered in technical colleges. It is a vocational trade that exposes students to skills. Olayinka (2019), asserted that motor vehicle mechanics is designed to produce competent auto mechanics craftsmen for the repairs, servicing and maintenance of motor vehicles in the country. According to the National Board for Technical Education (NBTE) (2016), auto mechanics craftsmen are

expected to test, diagnose, service and completely repair any fault on the motor vehicle to the manufacturers' specification.

In the report of NBTE (2016), the aim of motor vehicle mechanics is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. Report of Federal Government of Nigeria (2015), specified that components of motor vehicle mechanics are arranged in modules. The components include engine maintenance, suspension, steering and braking system, auto electricity, and transmission reconditioning work, major engine repair work and service station mechanic. Students of motor vehicle mechanic practice at technical colleges learn skills underthe guideline of their teachers.

The motor vehicle mechanic industry is already becoming more than what the roadside mechanic can handle. The industry is becoming more technologically advanced with many computerised systems, thus making it more sophisticated. In addition to the sophistication is the ceaseless influx of cars into the country. Abah (2017) stated that almost on a daily basis quite a number of new and fairly used vehicles are imported into the country. The tasks expected of the motor vehicle mechanic are to satisfactorily service the automobile engine and its support systems, to exhaustively diagnose any faults, and to completely repair or fix any problem on the motor vehicle. The efficiency of the motor vehicle mechanic will depend on the skills, knowledge and understanding he possesses of the modern motor vehicles and its technological innovations. Samuel (2020) noted that majority of the roadside mechanics lack the knowledge and are deficient in skills needed to fix anything right on modern motor vehicles.

One of the fascinating technologies today is the automobile also known as motor vehicle, car or automotive (Weigel, 2020). By definition, an automobile/car is a wheeled vehicle

that carries its own motor and transports passengers (Fadairo, 2015). Giri (2016) defined automobile as a self-propelled vehicle used for transportation of goods and passengers on land. Abdulkadir (2017) on the other hand described automobile as a generic term for self-propelled, reckless, personal or public carrier, which encompasses passengers' cars, recreational vehicles, taxis and buses used to transport people on highways or cross – country. Automobile is therefore the generic name that covers all sort of modern vehicles of diverse shapes and capacities that ply cities, highways and several areas. Motor vehicles are traditionally driven on four wheels, but there are variances of two, three or more wheels depending on their purpose.

The motor vehicle is itself a system made up of other subsystems. A system consists of a collection of interacting parts which are connected together to perform a particular function in unitary or part of a larger system; when it is divided into smaller systems, these smaller systemsare called subsystems (Giri, 2016). Conventionally the motor vehicle system is made up of thefollowing components and subsystems (Adah, 2017): the chassis, the body, the engine (thepower unit) and its essential systems such as the fuel system, the ignition system, the coolingsystem and the lubrication system, the transmission system, the suspension and steering system,the braking system and the electrical system. Makama (2017) explains that in the modern motorvehicle systems other components and sub-systems are added such as: emission control system(added to the power unit), the computer control system (often referred to as brain box), theairbag, internet access etc.

The motor vehicle or automobile was conceived from horse drawn carriages; the horse drawncarriage was a cart/wagon mounted on two or four wheels and pulled by horse(s) through ropes thus the power to pull the cart was the horse(s) (Fadairo, 2015). The writer

further observed that the development of a power unit i.e. the engine in the 1760s and early 1800s replaced the horse(s) and gave birth to what was then called the horseless carriage which has developed into the modern motor vehicle or automobile. Many names are associated with the development of automobiles. Prominent among them are: Nicholas Cugnot a French in 1769, Richard Treveitluck English in 1805, Etienne Linoisa French in 1860; others include Dugald Clark a Scotsman in1880, Dr. N. A. Otto a German in 1866, Carl Benz a German in 1866, and Henry Ford an American in 1896 (Weigel, 2020).

The motor vehicle or automobile has developed into a global modern industry rolling out millions of new cars and trucks in different models, which are all over the world. These different models are made with complex technological innovations that transform them into what is referred to as the modern motor vehicle or modern automobile. These have created challenges for the motor vehicle mechanic in terms of the skills needed for the maintenance of the modern automobiles (Baba, 2017).

A motor vehicle mechanic is a mechanic with a variety of automobile skills in a specific area or in a specific make of motor vehicle or automobile (Nwoke, 2015). In repairing cars, their main rule is to diagnose the problem accurately and quickly. They often have to quote prices for their customers before commencing work or after partial disassembly for inspection. According to Nwoke (2015), their job may involve the repair of specific part or replacement of one or more parts as assemblies. Basic vehicle maintenance is a fundamental part of a mechanic's work in modern industrialised countries, while in others they are only consulted when a vehicle is already showing signs of malfunction. Preventive maintenance is also a fundamental part of a mechanic's job, but this is not possible in the case of vehicles that are not regularly maintained by a mechanic. One

misunderstood aspect of preventive maintenance is scheduled replacement of various parts, which occur before failure to avoid far more expensive damage. Because this means that parts are replaced before any problem is observed, many vehicle owners will not understand why the expense is necessary. With the rapid advancement in technology, the mechanics' job has evolved from purely mechanical to include electronic technology. Because vehicles today possess complex computer and electronic systems, mechanics need to have a broader base of knowledge than in the past. Due to the increasingly labyrinthine nature of the technology that is now incorporated into motor vehicles or automobiles, most motor vehicle or automobile dealerships and independent workshops now provide sophisticated diagnostic computers to each technician, without which they would be unable to diagnose or repair a vehicle (Nwoke, 2015).

Osinem (2018) states that a mechanic usually works from the workshop in which the (well equipped) mechanic has access to a vehicle lift to access areas that are difficult to reach when the car is on the ground. Beside the workshop bound mechanic, there are mobile mechanics like those of the UK Automobile Association (the AA) which allows the car owner to receive assistance without the car necessarily having to be brought to a garage. In Nigeria clients can go to any garage and obtain the services of a mechanic outside the garage. This can be done when there is a breakdown and the motorist obtains the services of a mechanic explaining how the car stopped, the mechanic can get the necessary tools and carryout the repairs outside the garage.

Technological innovations are the technological improvements and enhancements made on products, systems, ways of manufacturing, ways of solving problems, and even ways of usage (Weigel, 2020). Samuel (2020) sees technological innovation as the process through which new (or improved) technologies are developed and brought into

widespread usage. Amoyedo (2016) on the other hand points out that technological innovation encompasses improvement in a process as well as developing entirely new process of technology through research, development, demonstration and deployment; these are seen widely spread in areas of energy and transportation. Technological innovations can be seen in motor vehicles from its emergence as a horse driven cart, to a simple mechanical machine known then as the horseless carriage, and to the modern motor vehicle a complex machine. These according to Giri (2016), culminate years of research and development. Weigel (2020) asserts that technological innovations on motor vehicles are the technological improvements which have brought about comfort, safety, smoothness of operation, ease of maintenance, strength, durability, cleaner and more economic services, higher output in terms of fuel consumption and power production, and have raised the social standards of owners of motor vehicles. Weigel (2020) further explains that innovation is also a key to resolving most of the global challenges that the motor vehicle or the automobile industry faces; without innovations by the motor industry, the entire concept of individual mobility is put to risk because there will be no new skills for manufacturing leading to growth. Umunadi (2019) explains this further by observing that in the beginning and many years following, the motor vehicle looked like the horse-drawn carriage that it was designed to replace, and that by 1919, about 90% of motor vehicles had carriage – like open bodies.

Motor Vehicle Mechanic Student

Motor vehicle mechanic student is a person who is learning vocational course offered in technical colleges in order to become motor mechanic craftsman and technicians. In his view, Nwachukwu (2018) stated that motor vehicle mechanic students learn the basic skills required to operate, maintain, install and repair motor vehicles. Abah (2017) said

that motor vehicle mechanic students may study the properties and behaviours of electrons under all conditions especially with reference to technical and industrial applications. At technical college level, motor vehicle mechanic students need to learn the safety practice skills required in handling tools and equipment in order to be safety conscious when carrying out a task in the workshop and workplace after graduation.

2.1.3 Safety Skills in Motor Vehicle Mechanic Trade

Safety is the freedom from dangers of both human and material resources. Okparaeke (2018) viewed safety as the avoidance of accident which may lead to injury to persons, wastage of materials and damage of tools, equipment or machines in the work site through adherence with compliance to precautionary measures. Olaitan, (2016) said that safety is an art of inculcating the necessity of taking precautions for the avoidance or reduction of accidents in order to protect people and properties. Safety practice is the repeated exercise with appropriate precautionary measures or caution aimed at preventingaccidents when one is performing occupational tasks. Also Umunadi (2019), holds the view that safety movement is an evolution, moving from injury prevention to accident control and fatal environment control.Accident and damages to tools, equipment and machines cannot be prevented in any field through repeated observance of precautionary measures but only when skills are involved in such exercises. Skill is the ability to do something well. Skill, according to Amoyedo (2016), is the well-established habits of doing things by the people. Okorie (2018) said that skill is a manual dexterity through repetitive performance of an operation. Skill is a well-established habit of doing something which is obtained through training and involves repetitive performance (Okoro, 2019).

Skill can be acquired through experience and training. Safety skills are required by the students of electrical installation at technical college level. This is necessary in order to

save the students from both minor and major accidents in the workshop. Safety skills in this study might be seen as special abilities, habit and capabilities, skilfulness and tactfulness in handling and using electrical tools, machines, and operating equipment or materials consciously. It equally involves following sequences of operations with caution when performing a task. Safety practice skills no doubt constitute a vital framework in the prevention of accidents in the workshops. Safety skills in this study might be seen as special abilities, habit and capabilities,skilfulness and tactfulness in handling and using electrical tools or materials, and operating equipment or machines consciously. It equally involves following sequences of operations with caution when performing a task. Okorie (2018) considers safety skill as the bedrock of modern educational practices needed to fit individuals into the world of work, education for living (life skills) and self-reliance. This implies that acquired skills enable individuals to develop their intellectual, physical, social, emotional and economic capacities.

Workshop is a room or place where machines, tools or equipment are kept for production of new components as well as for maintenance and repair (Samuel, 2020). A workshop is defined as a place where the leaner may experiment, test, construct, dismantle, repair, design, create, imagine, and study (Okorie, 2018). Going by this definition, a workshop is an essential facility for the study and practice of Technical/ Vocational Education. As a matter of facts, various types of workshops are in use, some of which are the single unit, General unit and Mobile shop. Workshop is a place where tools and power machines are kept for practical and production in technical colleges.

Approaches to Safety Skills Determination

There are numbers of approaches suitable for determination of safety practice skills for tasks in occupations or vocational subjects. The following will be considered for the purpose of this study.

1. The process approach
2. The audit safety system approach
3. The system analysis approach

Process Approach

Amoyedo (2016) observed that the safety skills of a worker could be identified or determined through the observance of the task performance sequence followed and the display or application of safety skills in carrying out task in an occupation or trade. Amoyedo observed that the competencies of workers will be displayed by their ability to follow the right work process and safety rule sequentially. Amoyedo, emphasized that, in identifying safety skills, each process of work, should be monitored and examined carefully.

Audit Safety System Approach

Audit safety system, according to Amoyedo (2016), is a management tool used to evaluate the "state-of-the-art" of safety program. He stressed that, it is most useful when performance is low and efforts are required to stimulate additional ones. He further maintained that, audit system involves the use of supervisory methods, which identify hazardous situations such as physical items like faulty tools, equipment or machines, and non- physical items like working methods, lack of discipline, lack of training, or use of incorrect equipment and so on. This approach is relevant and could be useful for training and practice during operation in the workshop.

The System Analysis Approach

Similarly, Yakubu (2018), observed that the principal method of analysing potential failure of equipment is to trace from the system and determine or detect the ultimate effect on the task being performed. He also stated that, accidents result from deficiencies in human operations, faults or defects in tools, equipment and environmental influences. He further stated that usually, failures are compound and these include mechanical or electrical failures, defective materials and environmental conditions such as extreme heat or noise levels inhibiting inter-communication. These could assist in tracing failures on machines or equipment. Training in detecting faults on tools, machines or equipment and materials could reduce occurrence of accident and promote safety in electrical workshop.

The system analysis approach suggested the following instructions that could assist to determine situations or errors that could lead to occurrence of injury or accident. They include:

1. Be attentive to sudden stop of a machine
2. Check materials before machining
3. Observe excessive heat from machine
4. Inspect machines before operating it

This implies that, regular observation and inspection of machines could assist to determine abnormality such as irrational sound or sudden stoppage of machine which is an indicator of improper condition or unfit of such machine. This also implies that motor vehicle students need to be safety conscious towards conditions that may arise as a result of unfit vehicles. According to Nwachukwu (2018), safety in the workshop requires careful planning, and that planning involves:

1. Developing a detailed guide sheet of instruction for students which should contain safety observances and precautions in the workshop
2. Prepare a list of tools, equipment and materials in use in the workshop and identifying their storage location
3. Classifying the tools, equipment and materials according to usage
4. Identifying these tools, equipment and materials in operational stages.
5. Ensuring that list of workshop safety rules and observance are readily available at various ends of the workshop.
6. In the event of introducing new activities in the workshop, the teacher should ensure that he carefully demonstrates the new activities to acquaint students with necessary operations and procedures using the right tools and equipment at the right time.

Similarly, Baba (2017), stated that there is nothing more important in school workshop/laboratory teaching situation than safety. He further stated that, it is impossible to list all the safety precautions which should be enforced for school workshop purpose. The nature of the workshop, the kind of instructional activities, and other factors determine the specific kind of safety regulations that are necessary. Since safety practice is regarded as the activities involved in ensuring that accidents are prevented from occurring. Therefore, safety practice skill is the ability to engage on repeated activities that could lead to avoidance of accident.

Accident, according to Weigel (2020), is unexpected, unplanned occurrence which can involve injury and damage to property. In the view of Abah (2017), an accident is a mishap which can cause some injuries to a person, damage to machines, tools and equipment and may result in loss of production. Abah further stated that, accident may

be due to worker's own fault which may be prevented by their own precautions or may be due to employer's fault for not making safe working environment. Thus, MVM students and workers need to be familiar with the causes of accident and be sure that precautions required to prevent the occurrence are adequately adhered to.

General Safety Rules

The following general safety rules sited by ITF (2019) are to be observed in the workshop or on the job site:

1. Always walk — do not run
2. Never talk to or interrupt anyone who is working on a machine
3. Remove power plug or turn off power supply to a machine when changing cutter or blades.
4. Never leave tool or pieces to stock lying on the table surfaces of a machine being used.5. When furnished with a machine, turn off all the power and wait until the blade or cutter has come to complete stop before leaving.
5. Always carefully check stock for knots, split, meal objects, and other defects before machining.
6. Any tool with a sharp cutting edge can cause serious injury if mishandled.
7. It should be understood that using guards does not necessarily prevent accidents.

Guards must be used correctly if they are to provide fullest protection. Also, it is impossible to do some operations, especially on the circular saw, with the regular guard in place. Therefore, there are times when special guards should be used.

1. Keep the floor around the machine clean. The danger from falling or slipping is always great.
2. Always use a brush to clean the table surface.
3. Always keep your eyes focused on where the cutting action is taking place.
4. When using tools for set-up works on a machine (1) select the right tool for the job (2) keep it in safe condition (3) keep it at a safe place.
5. Report strange noises or faulty operation of machine to the instructor.

Also the following are recommended by ITF (2019) as safety equipment: safety goggles, fire extinguishers, safety helmet, sand bucket, waste bin, work area, dust duct and turbo fan, protective hand gloves and boot etc. However, first aids box is one of the most important personal protective equipment in the workshop. Minor injuries occur in the workshops which had often led to serious disabilities to the worker and few cases led to death. These minor injuries could have been prevented or promptly attended to. It is therefore, imperative that workmen, students, their instructors and supervisors are equipped with adequate knowledge of first aid delivery. A first-aid box that contains simple requirements to handle minor accidents like burns, cuts, scalds and bruises, some analgesic for the treatment of common ailments like headaches and other pains should be kept in the box. The following items are recommended by (Olayinka, 2019).

i. A handbook on basic first-aid treatment
ii. Scissors
iii. Assorted sizes of adhesive plastic dressing
iv. Safety pins
v. Tweezers
vi. Cotton wool

vii. A clinical thermometer

viii. Iodine

ix. Razor blade

x. Packet of gauge

xi. Tissues, eye-bath

xii. Antiseptic cream lotion

xiii. Disinfectants

xiv. Crepe bandage

xv. Cotton bandage

xvi. Embrocation

xvii. A bottle of hydrogen peroxide

xviii. Analgesic tablets aspirin

xix. Soap.

2.1.4 Strategies for improving Safety Skills in Maintenance Operation

Workshop safety is important. Most of us knows the basic safety requirements in a workshop, but very little of us always enforce it. We are always in a hurry and don't see the need to take proper precautions before operating a machine. Workshop safety is actually more important than setting up your workshop (Yakubu, 2018).The saying "Speed kills" does not only apply to our roads, but also in our workshops. Thousands of unnecessary accidents could have been avoided if people only made time to think about workshop safety. Most of the equipment and tools used in the workshop can be very dangerous in the wrong and untrained hands. Every machine and tool is made for a specific job, and care must be taken not to use it for something it wasn't intended for. Proper training must be given to an aspiring automobile mechanic before he/she handles

dangerous machinery Ekon(2019),It only takes common sense and adhering to basic safety rules to make auto repair experience a pleasant and enjoyable one for many years to come. By keeping your mind on the job at hand, and concentrating on what you are doing there is no reason for injuries in the workplace.

Today, improving safety is high on the agenda in most workshops. This makes perfect sense, since a dedicated focus on improving safety standards, not only helps workshops ensure the well-being of their employees and customers but is also a sound economic investment, so how can you reduce the number of potential hazards and raise safety standards in MVM workshops? (Baba, 2017).

Light up your Workshop

When doing repair work, the right lighting, not only helps mechanics to detect faults on vehicles quickly and efficiently, but it also allows them to spot sharp objects that could potentially cause harm.However, not all lighting provides optimum safety. At AC Hydraulic, we like to distinguish between two sources of light: natural light from sunlight and artificial light from strip lights and so on (Okoro, 2019).

The artificial lighting, often used when working in the inspection pit, casts shadows which make it tricky to spot hazardous objects. Thus artificial sources of light increase the risk of mechanics accidently injuring themselves.On the contrary, natural light presents no safety risks as it provides a balanced pool of light making it easy to spot any sharp or dangerous objects.

Use the Right Tools

Tip number 2 doesn't really require any further explanation. But okay, let us elaborate on the safety benefits of using the right tools.If mechanics are using tools for anything other

than their correct purpose, they not only risk breaking the tools and the vehicle they are working on but may also harm themselves.

Speaking of the latter, this is mainly due to the position in which the mechanic is working. Using the right tools has a positive impact on your working posture, since they are specially designed for the job in hand. On the contrary, using the wrong tools often forces mechanics into ergonomically undesirable working postures, which is bad for their health and hampers their ability to deliver their best.

Make sure that your Tools are in Perfect Condition

And speaking of tools: To prevent hazardous situations, all tools must be maintained in perfect condition. So, remember to carry out continuous service checks and eliminate the risk of accidents in your workshop (Ekon, 2019).

Prevent that critical equipment crashes by making a maintenance plan with fixed service intervals with a service partner. The cost is small compared to downtime and, in the worst case, work accidents if the equipment breaks down.

Use a Trolley

Speaking of tidiness, using a trolley helps keep things in order and improves workshop safety. So, when doing repairs, grab a trolley and place all your tools on it rather than using the floor as your table. As a result, you eliminate the risk that people (including yourself) will trip over the tools.

Additionally, using a trolley means that you will not have to repeatedly stoop to grab tools from the floor – contributing to reduce the strain on your back.

After each Other

Mechanics often do repair work on their own, for example down in the pit. And what happens when nobody is watching what you are doing?Our experience tells us that sometimes mechanics working alone do repair work that they should not be doing on their own. They are simply being too bold – probably because nobody is watching, and it is a bit too inconvenient to ask for help.

Always ask yourself: Would I be doing it this way, if my colleagues were watching?Unfortunately, such behavior significantly increases the risk of accidents. Therefore, it is a good idea to look after each other and create a mutual understanding of the importance of abiding by the safety rules. This can be done in several ways, but one of the most effective is to replace the traditional pits with in ground lifts, as it makes it easier for mechanics to look after each other.

Avoid any Pitfalls

In a traditional workshop with inspection pits, mechanics and visitors risk falling into the pit. To prevent dangerous tripping hazards, the pit needs to be covered when not in use.Unfortunately, remembering to do this can be a problem if the pit does not come with sliding covers.An efficient way to eliminate the risk of these kinds of tripping hazards, is to replace the pit with an inground lift. With an inground lift, the crossbars are at floor level, meaning that there is no hole to fall into. It is simple yet very effective.

Make sure you have Optimum Mobility

Fortunately, the number of MVM workshop accidents is low, but should an incident occur, mechanics must be able to escape any possible danger. And that is why the mobility of mechanics is important for the safety of your workshop. Let us give you an example;

“If a mechanic is doing a repair and the load is accidently detached, he or she must be able to move away from the situation. However, this can be difficult when working in the pit with limited freedom to move”. To avoid the potential danger of being trapped, mechanics are safer when they have the optimum mobility that is achieved by working at floor level, e.g. with an inground lift.

Avoid Unnecessary Distractions

This should go without saying, it is one of the basic rules but with the prevalence of cell phones and other distractions, you should be aware of how this affects your safety. Each machine requires your utmost and full attention when working on them.Your phone may ring or get a text message, but make sure to finish what you are doing before you respond. I generally like to have music on in the background,this may even be frowned upon in some circumstances but it is not distracting to me, as long as it is not overwhelmingly load. The key is to always consider what you are doing at any given moment, and not letting your mind wonder off.

Please Read the Manual

This is definitely a big part of workshop safety. For each machine in your workshop there should be an operating manual. If not, you will be able to find information on Google or YouTube. There are thousands of videos on YouTube of machines in action and various reviews. Know how to operate each and every machine and make sure that your employees knows them as well. Make sure that all operating manuals are on hand for your workers and yourself if you need to refresh yourself on the workings of a specific machine (Giri, 2016).

According to Makame (2017), knowing the workings and capabilities of every machine will not only prevent injury, but you will also be able to get optimum production out of them. Even if you have an operating manual on a machine it is still a good idea to watch videos on YouTube to see how other people make use of them. I have learnt a lot over the years by searching on the net. Remember – Always read the safety tips and instructions.

Keep Your Workshop Clean

First of all, I am going to mention one of the things that I hate the most, condemn engine oil spilling all over the workshop. This is the cause of many unnecessary workshop injuries. I know that one needs to make use of engine oil on a regular basis, but you can do it in a much safer way by making use of square blow coming down from a car engine. In this way you make it more permanent, and you can work anywhere in the workshop without the danger of slipping off (Giri, 2016).

The workshop floor can very quickly get cluttered up with different obstacles like engine oil, hand tools and yes even power tools lying around. Believe me, I have seen it many times in workshops. People very often forget the importance regarding workshop safety.Having a vacuum system in place comes in very handy for two reasons, firstly keeping the workplace clean and tidy and secondly getting rid of another safety hazard. Having an air duster attachment that you can connect to your compressor is a must,you must clean out all vehicle parts on your workshop on a regular basis (Abah, 2017).

No Drugs, Alcohol or other Impairments

Just like you are not supposed to drive while under the influence, you are not supposed to work on a vehicle while having a few. This is common sense, and while I'm sure there

are plenty of guys that like to have a beer or two while they are working on a project, it's generally not recommended.Know your limits, and don't do anything stupid that will impair your vision or coordination putting yourself or anybody else in danger. This includes working while taking medication that dampens your ability to operate machinery properly.

Dress for the Occasion

One seldom think of the importance of wearing the appropriate clothing when working with machinery. According to Samuel (2020) a machine has no brain and getting tangled up in one happens very quickly. Do not wear baggy, loose, and otherwise ill-fitting clothing in your workshop. Do not wear jewelry or any other loose hanging items.

Nothing should be hanging down when you bend over to work on a machine. Tuck your tie into your shirt, but it is better to remove it completely. Long sleeves should be rolled up. Some people likes to wear gloves, but this practice is very dangerous. It can get caught up in a machine's moving parts very easily. There is nothing wrong with wearing gloves when moving an engine or tying a nut, but please remove them before operating a machine.

2.1.5 Problems Associated with Safety Skills in Maintenance Operation

The most recent Bureau of Labor Statistics injury and illness report revealed that auto mechanics and technicians experienced 13,150 nonfatal occupational injuries and illnesses resulting in valuable time away from work. This occupation involves the use of dangerous machinery, chemicals and tools that put employees at a greater risk for a workplace injury (Baba, 2017).Every workplace injury can create a domino effect in the efficiencies of your auto shop. If your best mechanic is injured and out of work for multiple months, you not only lose his/her level of productivity; you could incur higher

medical costs, wage replacement, repairs to damaged machinery and increased workers' compensation costs.

You can keep your workers safe by educating them on the most common types of auto shop accidents, providing them with regular training and requiring them to follow important safetyprocedures. The Occupational Safety and Health Administration (OSHA) provides detailed standards information online that can help you keep employees safe and remain in compliance.

According to Okoro (2019), mechanics work in a variety of settings and may be exposed to several hazards, including:

1. Exposure to chemicals, solvents, solder, and other products.
2. Exposure to gasoline or diesel exhaust.
3. Risk of electrical shock or burns.
4. Fire risk from fuels and other products.
5. Burns from battery acid, hot surfaces, exhaust, etc.
6. Potentially working in confined spaces.
7. Welding hazards, including UV radiation.
8. Working with compressed air.
9. Working near rotating parts (being caught in or between).
10. Working with explosive items, such as air bags.
11. Bursting of tires while repairing or installing.
12. Extreme temperatures.
13. Risk of pain or injury from awkward positions, repetitive manual tasks, or lifting heavy objects.

14. Risk of falling objects (including the vehicle) when working under vehicles, or with jacks, hoists, or hydraulic lifts.
15. Possibility of working at heights.
16. Risk of eye injury from flying particles.
17. Risk of hand injuries.
18. Slips, trips and falls.
19. Working with various hand tools, power tools and equipment.
20. Stress.
21. Shift work or extended work days.
22. Working alone.
23. Possible exposure to asbestos.
24. Exposure to noise.
25. Dealing with hostilecustomers.

We will identify the five most common injuries and illnesses auto mechanics and technicians encounter, as well as how to mitigate them effectively in your shop:

Strains, Sprains and Tears

These are the most common injuries auto mechanics and technicians face on the job. Preforming repetitive motions while under the hood of a vehicle or lifting and lowering machinery and heavy tools often contribute to these types of injuries.

Encourage workers to take a few minutes each morning to do a few warm-up exercises to get their body moving for the day. You might consider implementing a Stretch & Flex Program to help reduce strains, sprains and tears by providing employees 10 minutes each morning to complete several low-impact exercises.

Eye Injuries

Every day, about 2,000 U.S. workers sustain a work-related eye injury that requires medical attention. MVM students are particularly at risk for these types of injuries as they often work under cars and hoods where they are susceptible to falling debris and chemicals. The best way to prevent eye injuries is to ensure workers always utilize their safety goggles.

Chemical Burns

MVM students often handle hazardous and flammable liquids in their day to day work. Ensure these chemicals are properly labeled following Occupational Safety & Health Administration (OSHA) guidelines. Labels are required to have a pictogram; hazard and precautionary statements; a signal word, like "danger"; the product name and the supplier identification. They must also include safety handling information and what to do in case of exposure.

Containers around the shop should be checked routinely to ensure lids fit tightly and there is no leakage or spoilage. MVM students should always wear protective glasses and gloves when they handle chemicals.

Loss of Limb or Digit

Sometimes shop workers might need to operate power tools such as electric metal shears or angle grinders, increasing their risk of losing a limb or digit. Make it a priority to train students on the appropriate operating instructions, keeping guards in place and wearing protective gear when operating power tools. Designate a specific area or cabinet for stowing these tools once a job is finished. Ensure that these tools are properly maintained and inspected on a regular basis.

Slips, trips and falls

Many day-to-day operations of an MVM workshop include the use of slippery and greasy liquids that can result in a slick floor surface, increasing the risk of accidents. Ensure your students wear close-toed, anti-skid shoes.

Also make sure the floor stays clean and uncluttered, cleaning spills as soon as they occur. Utilize cones or signage warning students of slick areas.

2.1.6 Safety skills in maintenance operation

Working on vehicles can be a fun, exciting, and rewarding career. However, MVM teachers and students need to ensure the proper safety precautions and rules are implemented and followed at all times. Safety measures help protect students from accidental injuries to themselves, their co-students, teachers, and the vehicles they are repairing. The following is a list of general safety tips every MVMworkshop should use to keep everyone safe.

1. Never smoke in or near repair bays or garages. Vehicles contain flammable and combustible fluids which can easily be set on fire if a hot ash from a cigar or cigarette were to come into contact with such materials.
2. Keep work areas clean and organized. Pick up tools and use tool cabinets to keep walkways clear and free from clutter.
3. Never wear loose clothing or clothing that is ripped or torn. To prevent employees from wearing unacceptable attire, it is recommended to obtain customized uniforms and work apparel from a qualified uniform service company.
4. Wear protective gear at all times, as appropriate for the repair. Goggles, gloves, and ear protection should be worn when making certain types of repairs.
5. Make sure fire extinguishers are easily acceptable and appropriate for all potential fire types. In the event of a fire, extinguishers need to be accessed quickly and be

charged with the right materials to put out the type of fire: i.e., gas, oil, electrical, and so on.

6. Always disconnect the battery when working on electrical systems and near/around electrical wiring. Even when the vehicle is off, there is still the potential for current to pass through electrical wiring.
7. Never place hands, tools, or other objects near the engine while it is running. The moving parts and components could cause injury to a person or the vehicle itself.
8. Never work underneath a vehicle unless it has been properly supported. Raising the vehicle off the ground to access the underside requires verifying it is stable, and that there is no risk of the vehicle falling on top of the mechanic.
9. Always remove the keys from the ignition switch. Never leave the key in the ignition switch, as the key can draw an electrical charge from the battery. Also, avoid unplugging fuses and wiring harnesses while the key is in the "on" position. Otherwise, there is a risk of electrical shock, and/or electrical spikes that may damage electronic parts and wiring.
10. Be aware of the vehicle's temperature before beginning any work. The engine, manifold, exhaust system, and radiator could be hot and cause skin burns. Plus, the radiator coolant is still pressurized.

2.2 Theoretical Framework

Theories are postulates requiring further explanations in order to make meaning. According to Jamabo (2018), theories can be described as a set of concepts, principles, propositions and generalizations that are logically interconnected which present asystematic view of phenomena that enable the user to describe, explain, predict or advanceknowledge. Theories are thus the foundation of any research (Ali,2020). In other

words, theories are principles on which a subject of study is based. When atheory is applied in teaching and learning, it provides the principles, which directly governs it (Nwachukwu, 2018). Continuing, Nwachukwu stated that for a theory to be useful, it should playtwo important roles such as:

1. It should serve as a process of systematizing information in an area of knowledge therebyleading to the discovery of unknown facts; and
2. It should summarize information in such amanner that is easily used to explain a given concept.

Therefore, the theoretical foundations upon which this study is based are Dreyfus model of skillacquisition, Dynamic skill theory

2.2.1 Theory of skill acquisition

According to Hornby (2019), skill acquisition is a specific form of learning. it will be sufficient to define learning as the representation of information in memoryconcerning some environmental or cognitive event. Thus, learning refers to an organism storing something about its past in memory. Skill acquisition refers to a form of prolonged learning about a family of events. Through many pairings of similar stimuli with particular responses, a person can begin to developknowledge representations of how to respond in certain situations. These representations have some form of privileged status in memory because they can be retrieved more easily and reliably than memories of single events. Thus, skilled behaviors can become routinized and even automatic under some conditions.

Dekeyser's skill-learning theory (2019) states that in order to develop true fluency in an L2 proficiency, learners must have opportunities to create pragmatic

meaning.Accordingly, implicit knowledge arises out of explicit knowledge, when the latter is procedural zed through practice (Ellis, 2019).

According to Dekeyser (2019) The basic claim of skillacquisition theory is that the learning of a wide variety of skills shows a remarkable similarity in development from initial representation of knowledge through initial changes in behavior to eventual fluent, Spontaneous, largely effortless, and highly skilled behavior, and that this set of phenomena came unaccounted for by a set of basic principles common to the acquisition of all skills.The scientific roots of Skill Acquisition Theory can be found indifferent branches of psychology, which ranges from behaviorism to cognitivism and connectionism (Fisher, 2020). This theory draws on Anderson's Adaptive control of Thought (ACT) model which itself is a kind of cognitive stimulus-responsetheory.

2.2.2 Dreyfus model of skill acquisition

Hubert, (2018) propounded the "Dreyfus model of skill acquisition"which states that formal system of education is a gradual process that involves being embodied in different ways and developing skills that would make it possible for people to deal with the world. The main idea behind the Dreyfus's model of skill acquisition is the distinction they make between "knowing that" and "knowing how". The two concepts are considered as one concept, which is acquired through a formal system of education. According to Hubert (2018), learners acquire skills through instruction and experiences, they do not appear to leap suddenly from rule-guided "knowing that" to experienced based knowing-how. The Dreyfusmodel of skill acquisition is a model of how students acquire skills through formal instruction and practicing. They believe that there is a gradual process involved for a learner to go through in order to reach the stage of expertise or knowing-how.

The original model proposes that a student passes through five distinct stages: novice, competence, proficiency, expertise, and mastery. However, these stages of skill acquisition relate to this study in the following ways:

Novice Stage: At this first stage, a person follows rules as given, without context, with no sense of responsibility beyond following the rules exactly. In the process of learning the rules, students upon graduation are already exposed to the basic knowledge and principles of skill acquisition in order to prepare him for emerging technology skills forthe maintenance of modern vehicles.

Advanced Beginner: The learner at this stage recognizes new situations in which the rules may be applied. Student's performance improves to a relatively acceptable level only after the novice has had enough experience in copying the real situation, the students starts to show unique performance through personal experience.

Competency Stage: Competence develops when the individual develops organizing principles to quickly access the particular rules that are relevant to the specific task at hand; hence, competence is characterized by active decision making in choosing a course of action. Student's at this stage begins to get involved personally with the task. They start seeing more than one option from which they have to choose the best one for optimal performance.

Proficiency Stage: Proficiency is shown by individuals who develop intuition to guide their decisions and devise their own rules to formulate plans. The progression is thus from rigid adherence to rules to an intuitive mode of reasoning based on tacit knowledge. This is the stage where the student while intuitively understanding his task, still thinks analytically about his actions. The student must have acquired basic skills that will enable him think creatively towards becoming self-employed after graduation. Hence, analyzing

ways of raising capital, location of business and other business strategies becomes his priority.

Mastery Stage: Experts in general know what to do base on mature understanding of the task. An expert has had so much experience with the task that the skill of carrying out the task is part of him. He acts upon correct intuitions without analytically thinking about his every move. They also emphasize on the fact that practice is required for the agent to maintain the knowing-how. Without practice, the agent will gradually lose his expertise and s most likely to regress as far as the competence stage. This is the level to which the ability to create jobs which will in turn make a MVMW graduate self-employed becomes necessary.

2.2.3 Robert Dekyser theory of skill acquisition

Skill acquisition theory accounts for how people progress in learning a variety of skills, from initial learning to advanced proficiency. Skills studied include both cognitive and psychomotor skills, in domains that range from classroom learning to applications in sports and industry. The scientific roots of skill acquisition theory are found in various branches of psychology, but this research area has proven to be remarkably resilient through various developments in psychology, from behaviorism to cognitivism to connectionism. This chapter addresses skill acquisition theory as it pertains to second language acquisition. (Dekyser, 2019).

Skill acquisition is one of several competing theories of how we learn new languages. It's a theory based on the idea that skilled behavior in any area can become routinized and even automatic under certain conditions through repeated pairing of stimuli and

responses. When put like that, it looks a bit like the behaviorist view of stimulus-response learning which went out of fashion from the late 1950s.

The researcher Robert Dekeyser has argued that through the so-called power law of practice we can procedurals declarative knowledge of language over time. But he is clear that this only works in some conditions, with some structures and with some learners typically adult learners. The theory also claims that the kind of knowledge which can be automatized is very specific and does not transfer to other areas. For example, if you practice speaking you get better at speaking; if you practice listening you get better at listening. There are, therefore, different knowledge stores related to different skills.

Dekeyser defined "practice" as "specific activities in the second language, engaged in systematically, deliberately, with the goal of developing knowledge of and skills in the second language" (DeKeyser, 2019).

Practice can include drills, but Dekeyser argues that meaningful drills which the expression of real feelings and thoughts are better than mechanical drills aimed merely at practicing forms. He says that the transfer of declarative to procedural knowledge is likely to occur when the practice resembles natural communicative activity. This is tied in with the theory that memories are best retrieved when the conditions under which they were created can be replicated (Transfer-Appropriate Processing).

To recap, this theory claims that the effects of teaching are skill-specific. So input-based instruction develops receptive skills, and output practice develops production skills. To support this claim, experiments have been carried out (for example with invented languages) to see if automatisation can take place and if this is skill-specific. In these

studies, acquisition of production or comprehension skills was less apparent if only the opposite skill was practiced.

The theory has been criticized by Ellis (2019) for a couple of reasons. It doesn't take account of learners' "in-built syllabus" - the fact that we tend to acquire grammatical structures in a certain, rather fixed order. And secondly, the fact that we seem to acquire lots of knowledge and skill incidentally, without passing through a declarative knowledge stage.

2.2.4 Dynamic skill theory

Fisher (2020) propounded the theory "the dynamic skill theory", which states that skill within domains may promote or suppress other skills as they first develop resulting in spurts of growth in one skill concurrently with regression in another. The dynamic skill theory is related to the present study in that when it is applied to skills in automobile emerging technology. Assuch, it will enhance skill development and improvement in the utilization of new technologies(diagnostic/scan tools and equipment).

2.3 Related Empirical Studies

Okparaeke (2018) conducted a study on skills for improvement of maintenance needed by automobile technician's trades. Four research questions were developed and answered. Survey research method was adopted with a population of 79 motor vehicle technicians trained through the formal vocational institutions and 81 automobile Technicians being trained through apprenticeship system drawn from 23 automobile workshops. The data collected were analysed using mean and one-way analysis of variance (ANOVA) and correlation coefficient. The difference between the previous study and the present study is that the previous study used motor vehicle technicians in Tonga (a country in the South Pacific Ocean), while the present study used technical college motor vehicle mechanic

self-employed graduates in plateau state, Nigeria. In this study two sets of technicians were used, one trained through the formal system and the other trained through the apprenticeship system while the present study used two sets of graduates all trained through the formal system. The result of the study revealed that changes in workplace and procedure as a result of technological innovations raise many concerns about the adequacy of workers' skills in that country. Okparaeke carried out his study in faraway Tonga (a country in the South Pacific Ocean). Similarly, the presents study seeks to determine the skills improvement needs of a Nigerian motor vehicle mechanic graduate that will be required to maintain modern automobiles which enter the country on daily basis. It is also similar to the present study in methodology, research design, instrument and data analysis tools.

However, Okorie (2018) carried out a research on Skill Improvement Needs of Technical Teachers for Maintenance of Woodwork Equipment in Secondary Schools in Ogun State with four research questions. The study aimed at determining skills acquired and those needed, a survey design was used and the population was 72. A structured questionnaire was used for data collection. The findings include: woodwork teachers do not possess the competencies required by them to effectively maintain woodwork equipment. The present study is related to the previous study because both of them have skills needed as an objective. However, the previous study differs from the present study because the previous study was on skill improvement need while the present is on safety skills required.

Yakubu (2018) conducted a study to determine the work skills improvement need of graduates of technical colleges in motor vehicle mechanic practice for employment in modern Nigeria. The study was carried out in Taraba state of Nigeria. Three research

questions were formulated to guide the research study. The study adopted a survey research design and the population of the study consisted of 40 graduates of motor vehicle mechanic practice from industries in the study area. There was no sample for the study, since the population was manageable. A structured questionnaire containing 43 work skill items was used for the collection of data from the respondents. The work skill questionnaire was divided into skills needed and performance with each having a 4-point response scale and a corresponding value of 4,3,2,1 for the two groups respectively. Split half method was employed to determine the internal consistency of the work skills questionnaire item with a reliability coefficient of 0.83. The instrument was analysed using weighted mean and improvement needed index (INI). Findings of the study revealed that graduates of motor vehicle mechanics practice from technical colleges need improvement in work skills for engine maintenance, steering and braking system and auto electricity in order to be employed in Taraba state. The study therefore recommended that all the identified work skills in engine maintenance, steering and braking system and auto electricity should be integrated into the curriculum of motor vehicle mechanic practice in technical colleges for training students.

In a related study carried out by Osmein (2018) to ascertain the technical skills improvement needs of metal work technology teachers for entrepreneurship in response to Millennium Development Goal (MDG) for quality assurance, 16 technical colleges offering metal work technology in Lagos and Ogun states were used for the study. Three research questions were formulated to guide the study. A structured questionnaire was used to collect relevant data from 110 metal work teachers. Data collected were analyzed using the statistical mean and standard deviation. Cronbach Alpha Reliability technique of 0.98 was established for the instrument. The findings of the study revealed that metal work technology teachers in technical colleges need modern metal work technology skills

for quality training of metal work technology students in technical colleges for occupation in metal work industry and productive self-employment. The recommendations of the study among others include the organization of anextensive training for metal work technology teachers in technical colleges in Lagos and Ogunstates to keep them abreast with the contemporary practices as well as update their skills in metalwork technology; the management of metal work industries and in-house personnel should beco-opted to consolidate teachers teaching with actual work experience.

Umunadi (2019) also carried out a study on the integration of new technological innovations in automobiles into the curriculum of Nigerian Technical College programmes. The area of the study was Benue, Enugu and Kaduna states. The population of the study comprised of 81 subjects made up of all mechanical engineering or technology staff of the two automobile plants and auto-mechanic teachers in the technical colleges in these selected states. The entire population was used for the study. The instrument for data collection was a 41 item structured questionnaire designed by the researcher based on the research questions used for the study. The findings of the study revealed that 41 new innovations comprising of 10 in the engine; 11 in the transmission, suspension, steering and braking systems; 20 in the electrical/electronic and auxiliary systems were rated as important to be integrated into the curriculum. Included among these prominent new automobile innovations are: electronic fuel injection system (EFI), electronic ignition system, variable valve timing intelligence (VVV-i), super charging, emission control systems, on-Board Diagnostic system, All Wheel Steering System (AWS), All Wheel Driving System (AWD) and Anti-Lock Braking System (ABS) etc. The findings of this study also revealed that there is a significant difference in the mean responses of industrial workers and technical teachers on five of the identified new technological innovations in automobiles for which the null hypotheses were rejected.

These items included the On-Board Diagnostic system, safety airbags and airbag curtains, automatic front windscreen wiper, automatic headlight brightness switch and multiplex wiring. Based on the findings and implications of the study, recommendations were made. These recommendations are as follows: Further studies should be conducted to identify all the other elements of the new innovations needed for the development of comprehensive curricular contents including the skills and theoretical contents entailed in their study as well as the new tools and equipment needed.

The curriculum for teacher training programmes should be reviewed to include these innovations in order to prepare teachers who will be able to implement the curriculum with the new contents for the technical college programmes. The study is related to the current study in the aspect of new technological innovations in automobiles, though the study was conducted on mechanical staff of automobile plants and technical college teachers, the present study will be conducted on industrial supervisors, technicians and instructors in modern automobile workshops and technical colleges.

Okoro (2019), conducted a research on the prevention and management of automobile workshop accidents in technical colleges in Niger State, Nigeria. Three research questions and three hypotheses guided the study. A descriptive survey research design was adopted for the study. The population of the study was 41 comprising of 27 experienced and 14 less experienced automobile teachers from all seven Technical Colleges in Niger State. Entire population was studied; hence there was no need for the adoption of any sampling technique because the population for the study was of manageable size. A structured questionnaire developed by the researchers was used for the study, named Prevention Management of Automobile Workshop Accidents Questionnaire (PMAWAQ). The questionnaire was validated by three experts from

Department of Industrial and Technology Education FUT Minna. Cronbach Alpha method was used to determine the internal consistency of the questionnaire items. Thus, a reliability coefficient of 0.95 was obtained. The questionnaire was assigned four points rating scale as follows; Strongly Agree, Agree, Disagree, Strongly Disagree with values of 4, 3, 2 and 1 respectively.

The questionnaire return rate was 95.4%. Mean and Standard Deviation were used to analyzed the data for answering the research questions; while t-test was used to test the hypotheses at 0.05 level of significance. For answering research questions, any item with a mean response of 2.50 and above was considered Agree while any item with mean response below 2.50 was considered as Disagree. For testing the null hypotheses, any item with significant p-value of 0.05 and below is considered significant while any item with significant p-value above 0.05 is considered not significant. It was found that eleven types of accidents frequently occurred in Automobile Workshops Technical Colleges in Niger State; eight mechanisms should be adopted in the management of automobile workshop in technical colleges in Niger State. The study recommended that safety equipment such as fire extinguishers, first aid box and workshop coat should be provided adequately in the workshops and workshop personnel with good and training habit should be employed.

Nnadi (2019) conducted a study on skills for improvement of maintenance needed by automobile technician's trades. Four research questions were developed and answered. Survey research method was adopted with a population of 79 motor vehicle technicians trained through the formal vocational institutions and 81 automobile Technicians being trained through apprenticeship system drawn from 23 automobile workshops. The data collected were analysed using mean and one-way analysis of variance (ANOVA) and

correlation coefficient. The difference between the previous study and the present study is that the previous study used motor vehicle technicians in Tonga (a country in the South Pacific Ocean), while the present study used technical college motor vehicle mechanic self-employed graduates in plateau state, Nigeria. In this study two sets of technicians were used, one trained through the formal system and the other trained through the apprenticeship system while the present study used two sets of graduates all trained through the formal system. The result of the study revealed that changes in workplace and procedure as a result of technological innovations raise many concerns about the adequacy of worker's skills in that country. Nnadi carried out his study in faraway Tonga (a country in the South Pacific Ocean). Similarly, the presents study seeks to determine the skills improvement needs of a Nigerian motor vehicle mechanic graduate that will be required to maintain modern automobiles which enter the country on daily basis. It is also similar to the present study in methodology, research design, instrument and data analysis tools.

Hornby (2019) conducted a study on the potential impact of technology on skills requirement for the future jobs. The study adopted the survey method with a population of 1018with no sampling in Tokyo - Japan. A structured questionnaire was used to collect data. The data was analysed using frequency and percentage scores. The result revealed that new technological innovations are yielding an increased array of new components which are incorporated into modern machineries including the automobile. Hornby's study was carried out in Japanwhich is a leading automobile manufacturing industry in contrast to Nigeria, a consumer nation.This research work has similarities to the present study in research design, and instrument fordata collection. The difference between the two studies is that Hornby is concerned about skills for future jobs, while this study

focuses on what the graduates are presently doing and what is expected of them to meet up with the ongoing industrial challenges.

Okonkwo (2020) conducted a research on new trends in industrial and automobile maintenance and processes. The study adopted a survey method, with structured questionnaire as means for data collection which was validated by three experts from the production industry. Thepopulation for the study was 123 auto technicians and 230 technicians in computerised operations in biscuit making factory in the United States of America. Percentages and rank order was the statistical tool used for data analysis. T-test statistic was used to test the hypotheses at 0.05 level of significance. The result of the study revealed that the overall pattern of knowledge and skills required by the factory technicians in terms of maintenance has changed significantly due to technological advancements. This work is related to the present study particularly in the automobile maintenance sector, population which is manageable without sampling, research design, and instrument for data collection which was a structured questionnaire. However, the two studies differ in the method of data analysis while Buchanan used percentage and rank order to analyse his data, the present work seeks to use mean and t-test statistic for the analysis of data to be collected. The difference here is that Buchanan focused on factory technicians while this study is concerned about self-employed technical college motor mechanic graduates.

Furthermore, Igbo (2021) conducted a study on the technical skills improvement needs of Auto - electronic technicians in the maintenance of modern day automobiles in Niger state of Nigeria. The study adopted survey research method with a population of 239 Auto –electronic technicians. The instrument used to collect the data was a structured questionnaire, and the data collected was analysed using mean and standard deviation.

The hypotheses of the56work were tested using t-test statistic at 0.05 level of significance. The result revealed that with the accelerated pace of technological development in electronics and its application on the modern automobile, there is need for the improvement of skills by the automobile electronics technicians. The similarities of the previous work and the present work are in terms of the population, research design, instrument and methodology of data collection and analysis.

2.4 Summary of Literature Reviewed

The related literature was reviewed on technical education, motor vehicle mechanic trade, safety skills in motor vehicle mechanic trade, and strategies for improving safety skills in maintenance operation, problems associated with safety skills in maintenance. In related empirical studies, a research was conducted on new trends in industrial and automobile maintenance and processes by Amoyedo (2016) was reviewed. The author found out that MVM students have little or no safety skills in automobile maintenance such as using automobile hand tools, potable tools, and operating automobile machines. A study on skills for improvement of maintenance needed by automobile technician's trades by Okpharaeke (2018) was conducted. Also a study on Skill Improvement Needs of Technical Teachers for Maintenance of Woodwork Equipment in Secondary Schools in Ogun State by Okorie (2018) was carried out. The study revealed that teachers teaching method on safety is not encouraging due to their qualification and lack of industrial experience. From the literature reviewed, it seems clear that no study was carried out on safety skills required in handling automobile equipment and none of the study was carried out in Niger State. This is the gap the study is set to fill by treating "industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger State, Nigeria.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter describes Research design, Area of study, population of the study, Instrument for data collection, Validation of the instrument, Administration of the instrument, Method of data analysis and Decision rules respectively.

3.1 Research Design

The descriptive survey research method with the use of a structured questionnaire was used to collect the required information from the respondents. The survey research was adopted because survey design generally to effectively investigate problems in realistic settings. Nwachukwu (2018) described survey research as that which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group.

3.4 Area of the Study

This study was carried out in Niger State, a state in central Nigeria and the largest state in the country which shares boundaries with Kaduna State (North-East), Federal Capital Territory (South-East), Kebbi State (North-West) and Kwara State (South-West).

This study covers five government technical colleges in Niger State. The following are the technical colleges: Government Technical College, Eyagi Bida, Government Technical College, Kontagora, Government Technical College, Minna, Government Technical College, New Bussa and Suleiman Barau Science and Technical College, Suleja.

3.3 Population of the Study

The targeted population for this study comprised of 60 automobile workshop supervisors from the automobile workshops in Minna, 25 motor vehicle mechanic teachers in five technical colleges in Niger State and 20 automobile technology lecturers in higher institutions in Niger state making it a total of 105. The population was estimated based on the numbers of respondents.

3.4 Sample and Sampling Technique

Due to the fact that the number of MVM teachers and automobile lecturers are small and manageable, there was no sampling. Therefore the entire number of MVM teachers and lecturers was used for this study which is 25 and 20 respectively. Due to the scattered number of automobile workshops in Minna metropolis, purposive sampling technique was used to select 60 automobile workshop supervisors from the registered workshops in Minna. Thus the sampling size for this study is 105.

Table 3.1: Population distribution of respondents

S/No	Technical Colleges	No. of MVM Teachers
1	Government Technical College, Minna	5
2	Government Technical College, EyagiBida	5
3	Suleiman Barau Science and Technical College, Suleja	6
4	Government Technical College, New Bussa	5
5	Government Technical College, Kontagora	4
	Total	**25**

Source: Niger State Science and Technical Schools Board

Table 3.2: Population distribution of respondents in tertiary institute

S/No	Tertiary Institute	No. of Auto Tech Lecturers
1	Federal University of Technology Minna	6
2	Niger State College of Education	7
3	Minna Institute of Innovation Technology	7
	Total	**20**

3.5 Instrument for Data Collection

The instrument used for data collection is questionnaire. The questionnaire is to determine the opinion of the respondents that comprises of motor vehicle mechanic teachers and automobile technology lecturers in Niger State. The questionnaire is divided into two parts (i and ii). Part i; consist of respondents "personal data", containing information about gender, age, categories, qualification and Part ii; is grouped into (A,B,C,D and E) where question A consist of 15 items which sought to elicit information on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation in Niger State, sub-section B consist of 15 items which sought to elicit information on the industrial safety skills needed by MVM students in operating equipment and machine in automobile maintenance operation in Niger State, sub-section C consist of 14 items which sought to elicit information on the industrial skills needed by MVM students in handling material in automobile maintenance operation in Niger State, sub-section D consist of 15 items which sought to elicit information on the industrial safety skills needed by MVM students in overhauling an automobile engine in Niger State and sub-section E consist of 15 items which sought to elicit information on the strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation in Niger State.

3.6 Validation of the Instrument

The instrument for the data collection was designed by the researcher and was validated by three lectures in the Department of Industrial and Technology Education (I.T.E). The validators were requested to check the suitability and clarity of the item who found it appropriate for the study before administering.

3.7 Administration of the Instrument

The instrument use for data collection was administered to the respondent by the researcher and a researcher assistant within the study area selected for this research.

3.8 Method of Data Analysis

The data collected by the researcher was analyzed using mean, standard deviation and t-test as statistical tools. A four-point rating scale was employed with the following response.

For research question 1 to 4, the response options are:

Highly needed	(HN)	=	4 points
Needed	(N)	=	3 points
Moderately Needed	(MN)	=	2 points
Not Needed	(NN)	=	1 point

For research question 5, the response options are:

Strongly Agree	(SA)	=	4 points
Agree	(A)	=	3 points
Disagree	(D)	=	2 points
Strongly Disagree	(SD)	=	1 point

$\frac{4+3+2+1}{44} = \frac{10}{} = 2.5$

The mean response of each item was obtained by using the following formula

$$\overline{X}_1 \frac{\sum FX}{N}$$

Where

£ = Summation of

X = normal value of option (mean)

N = number of response of an item

F = frequency of response of each option

$\overline{X}_2$= Grand mean of each item

3.9 Decision Rule

To determine the level of acceptance, mean response. 2.50 and above was considered needed or Accept. While mean response of 2.49 and below was equally considered Not-Needed or Disagreed. For testing hypothesis, any item that has its t- value equal or less was considered not significant, and any item that has its above t-critical was considered significant. For testing the hypothesis, the significant value compared with p-value if the p-value is less than 0.05, it is significant (rejected), while if the p-value id greater than 0.05, it is not significant

CHAPTER FOUR

4.0 PRESENTATION AND DATA ANALYSIS

This chapter deals with the presentation and analysis of data with respect to the research questions formulated for this study, the result of this data analysis for the research questions are presented first, followed by those of the hypotheses tested for the study.

4.1 Research Question 1

What are the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation?

Table 4.1: mean response on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation. (N1=45, N2=60).

S/N	ITEMS	X_1	X_2	X_t	SD_A	Remark
1	Selecting the right tools for the right job	3.0	2.85	3.0	0.34	Needed
2	Using tools with a good handle always	3.0	2.85	3.0	0.15	Needed
3	Checking the sharpness of scribers, spanners, and screwdrivers before use.	3.75	3.85	3.85	0.14	Needed
4	Knowing the capacity of any tool before using it for any work.	3.25	3.0	3.25	0.31	Needed
5	Using insulated hand tools for auto electrical work	2.85	3.0	3.95	0.13	Needed
6	Give a tool to colleague through the handle.	3.65	3.75	3.75	0.09	Needed
7	Always return tools to the tool box after use	3.95	3.95	4.0	0.10	Needed
8	Always oil the tools after washing or cleaning to avoid roasting	3.75	3.85	3.85	0.23	Needed
9	Hand gloves should worn when using tools	2.85	3.0	2.95	0.21	Needed
10	Approved motor vehicle tools should be used in the workshop	3.65	3.75	3.65	0.37	Needed
11	Report any damaged tool to the workshop officer	3.95	3.95	3.95	0.15	Needed
12	Regular inspection of tools should be carried out	3.75	3.85	3.75	0.27	Needed
13	Damaged tools should be removed from the workshop	2.85	3.0	2.95	0.13	Needed
14	Do not play with sharp tools	1.85	1.85	1.95	0.10	Needed
15	Avoid keeping tools carelessly after use to avoid injuries	1.85	1.55	1.75	0.25	Needed

KEY:
X1= average mean responses of automobile technology teachers,
X2= average mean responses of automobile works supervisor,
N1= number of automobile technology teachers,

N2= number of automobile works supervisor,

Table 4.1 reviews that the respondents agreed with item 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 with a mean score above 2.50 as being needed. While item 14 and 15 disagreed with a mean score below 2.50 as not needed. This means that item 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13 is being needed as an industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation in Niger State. While item 14 and 15 are not needed.

4.2 Research Question 2

What are the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation?

Table 4.2 Mean responses of the respondents on the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation. (N1= 45, N2=60)

S/N	ITEMS	X_1	X_2	X_t	SD_A	Remark
1	Protecting hands with gloves and wearing safety shoes when operating portable tools and machines	3.0	2.85	2.85	0.15	Needed
2	Wear approved eye protector when operating a power tool.	3.25	3.65	3.55	0.20	Needed
3	Stop power tools or machines before cleaning activities or making any adjustment.	3.45	3.75	3.55	0.18	Needed
4	Switch off the socket outlet before power tools or machine is connected.	3.65	3.0	3.45	0.16	Needed
5	Disconnect the power tool or machine immediately a strange sound is noticed.	2,95	3,65	3.35	0.25	Needed
6	Test the power tool or machine for functionality before use.	3.55	3.5	3.5	0.33	Needed
7	Keep the body away from the rotating part of the power machine	3.75	1.4	2.6	0.28	Needed
8	Never adjust any power tool or machine while running	2.85	2.85	2.75	0.06	Needed
9	Check faults in the power tool or machines before re-use.	1.5	3.6	2.6	0.15	Needed
10	Use brush to remove chips from drilling machine	2.7	3.5	3.1	0.50	Needed
11	Concentrate on work while using power tool or machine	2.75	2.85	3.0	0.15	Needed
12	Use apron or overall while operating any power tool or machine.	3.25	3.65	3.55	0.12	Needed
13	Report to the instructor any strange noise from the power tool or machine	3.55	3.75	3.65	0.10	Needed
14	Stop operating power tool or machine if job is boring or when you get tired.	3.65	3.0	3.35	0.23	Needed
15	Remove coat and jacket, tie and roll up loose sleeves before operating any machine.	275	3.0	3.35	0.21	Needed

KEY:

X1= average mean responses of automobile technology teachers,
X2= average mean responses of automobile works supervisor,
N1= number of automobile technology teachers,
N2= number of automobile works supervisor.

Table 4.2 reviews that the respondents agreed with item 2,3,4,5,6,7,9,10,12,13 and 14 with a mean score above 2.50 respectively as being needed. While item 1,8,11 and 15 disagreed with a mean score below 2.50 as not needed. This means that item 2,3,4,5,6,7,9,10,12,13 and 14 are needed as an industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation in Niger State. While item 1,8,11 and 15 are not needed.

4.3 Research Question 3

What are the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation?

Table 4.3 Mean responses of the respondents on the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation. (N1= 45, N2=60)

S/N	ITEMS	X_1	X_2	X_t	SD_A	Remark
1	Avoid lifting materials from the floor while seated	3.0	2.85	2.95	0.15	Needed
2	Never lift a heavy material over an obstacle alone	3.0	2.85	2.95	0.20	Needed
3	Lift a material in areas with adequate footing, space and lighting	3.75	3.85	3.75	0.18	Needed
4	Do not left heavy object alone.	3.95	3.92	3.94	0.41	Needed
5	Keep lifts between shoulders and knuckle height.	3.82	3.0	2.74	0.16	Needed
6	Use the right materials for the right job	2.82	3.85	2.85	0.24	Needed
7	Use conveyors, slides or chutes to eliminate pushing or pulling while handling a material.	2.85	3.0	2.91	0.45	Needed
8	Do not stand or seat on a sharp material	3.23	3.25	3.22	0.45	Needed
9	Always use face mask and goggle when handling acidic materials	3.74	3.85	3.73	0.37	Needed
10	When moving material, attach handles or holders to loads.	3.0	2.88	2.92	0.46	Needed
11	Always wear appropriate personal protective equipment when handling materials	3.0	2.87	2.91	0.16	Needed
12	Use proper lifting techniques to prevent injuries from oversize materials	3.75	3.82	3.74	0.39	Needed
13	Keep feet apart to give a balanced and stable base when lifting a material.	3.51	2.82	3.0	0.49	Needed
14	Ascertain intended path of movement is clear before lifting a material.	3.55	3.0	285	0.37	needed

KEY:
X1= average mean responses of automobile technology teachers,
X2= average mean responses of automobile works supervisor,
N1= number of automobile technology teachers,
N2= number of automobile works supervisor.

Table 4.3 reviews that the respondents agreed with item 1, 2, 3, 4, 7, 8, 9, 10, 11 and 12 with a mean score above 2.50 respectively as being needed. While item 5,6,13 and 14 disagreed with a mean score below 2.50 as not needed. This means that item 1, 2, 3, 4, 7, 8, 9, 10, 11 and 12 are needed as an industrial safety skills needed by MVM students in

handling materials in automobile maintenance operation in Niger State. While item 5,6,13 and 14 are not needed.

4.4 Research Question 4

What are the industrial safety skills needed by MVM students in overhauling of automobile engine?

Table 4.4: mean response on the industrial safety skills needed by MVM students in overhauling of automobile engine. (N1=45, N2=60).

S/N	ITEMS	X_1	X_2	X_t	SD_A	Remark
1	Disassemble and re-assemble the automobile engine in correct sequence	3.75	3.89	3.75	0.33	Needed
2	Replace a bad automobile engine part with a good one	3.76	3.84	3.75	0.26	Needed
3	Carry out repairs of automobile engine according to manufacturers' specification	3.82	3.97	3.84	0.17	Needed
4	Perform all kinds of mechanical test on automobile engine before dissembling	3.81	3.73	3.82	0.08	Needed
5	Trace faults in the automobile engine using appropriate tools and equipment.	3.0	2.75	3.0	0.13	Needed
6	Dismantle faulty units of an automobile engine carefully and correctly	3.21	3.0	3.25	0.50	Needed
7	Interpret charts and service manuals of an automobile engine	3.25	3.0	2.95	0.13	Needed
8	Replacing cut timing belt on an automobile engine with a new one before using	3.72	2.75	3.0	0.30	Needed
9	Inspecting drive belts on an automobile engine before using	3.23	3.0	3.26	0.18	Needed
10	Adjust drive belts on an automobile engine machine before using	2.77	2.83	3.0	0.39	Needed
11	Replace oil filters with new ones.	3.31	3.0	3.23	0.50	Needed
12	Replace used engine oil with new one.	3.35	2.93	3.0	0.46	Needed
13	Service carburetors correctly	2.75	2.81	2.85	0.15	Needed
14	Interpret engine analyzer tests	2.81	3.0	2.81	0.15	Needed
15	Inspect and adjust automobile engine valves	2.83	3.81	2.83	0.12	Needed

KEY:

X1= average mean responses of automobile technology teachers,
X2= average mean responses of automobile works supervisor,
N1= number of automobile technology teachers,
N2= number of automobile works supervisor.

Table 4.4 reviews that the respondents agreed with item 1,2,3,4,6,9,11,12 and 13 with a mean score above 2.50 respectively as being needed. While item 5,7,8,10,14 and 15 disagreed with a mean score below 2.50 as not needed. This means that item 1,2,3,4,6,9,11,12 and 13 are needed as an industrial safety skills needed by MVM students in overhauling of automobile engine in Niger State. While item 5,7,8,10,14 and 15 are not needed.

4.5 Research Question 5

What are the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation?

Table 4.5: mean response on the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation. (N1=45, N2=60).

S/N	ITEMS	X_1	X_2	X_t	SD_A	Remark
1	Employing of qualify personnel in handling practicals	3.71	3.85	3.73	0.45	Agree
2	Provision of protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping	3.74	3.83	3.78	0.30	Agree
3	Proper orientation on the basics of safety skills of motor vehicle mechanic students in technical colleges	3.83	3.92	3.81	0.15	Agree
5	Drifting of profession should be put into consideration specially in technical colleges	3.83	3.74	3.83	0.46	Agree
6	Ensuring that approved protective wears are worn by students	3.25	3.28	3.23	0.68	Agree
7	Facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges	3.72	3.84	3.77	0.50	Agree
8	Relevant training on safety regarding motor vehicle mechanic students be put in place in technical colleges	3.0	2.82	2.95	0.30	Agree
9	Enforcing vision and mission of motor vehicle mechanic in technical colleges.	3.0	2.86	2.95	0.18	Agree
10	Regular evaluation of vision and mission of safety skills in technical colleges.	3.74	3.88	3.79	0.35	Agree
11	Proper layout of workshop to show clearly carriage ways and location of machine tools	3.0	3.67	3.53	0.39	Agree
12	Organizing conferences/seminars regularly for technical teachers	3.45	3.73	3.67	0.50	Agree
13	Organizing tools on the shelves and tool boxes based on the function they perform	1.81	3.56	3.0	0.12	Agree
14	Creating committee that will set modalities/strategies for maintenance and decide penalties for MVM students who does not use safety equipment.	3.73	3.82	2.73	0.27	Agree
15	Motor vehicle mechanic students should belong to professional safety association like red cross, safety club etc.	2.85	3.0	2.92	0.27	Agree

KEY:
X1= average mean responses of automobile technology teachers,
X2= average mean responses of automobile works supervisor,
N1= number of automobile technology teachers,
N2= number of automobile works supervisor.

Table 4.5 reviews that the respondents agreed with item 1,2,3,4,5,6,7,8,9,10,11 and 14 with a mean score above 2.50 respectively as being needed. While item 12 and 13 disagreed with a mean score below 2.50 as not needed. This means that item 1,2,3,4,5,6,7,8,9,10,11 and 14 agreed to the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation in Niger State. While item 12 and 13 are not needed.

4.6 Hypotheses 1

There will be no significant difference in the mean response of automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation. Table 4.6: presents test of this hypotheses.

Table 4.6: t-test analysis of the respondents of automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation in Niger State.

S/N	ITEMS	SD_1	SD_2	t-test	Remark
1	Selecting the right tools for the right job	0.81	0.68	-1.65	A
2	Using tools with a good handle always	0.79	0.40	2.86	NA
3	Checking the sharpness of scribers, spanners, and screwdrivers before use.	0.72	0.52	0.00	A
4	Knowing the capacity of any tool before using it for any work.	0.67	0.47	-1.69	NA
5	Using insulated hand tools for auto electrical work	0.53	0.51	1.39	A
6	Give a tool to colleague through the handle.	0.64	0.40	1.90	NA
7	Always return tools to the tool box after use	0.71	0.30	3.44	NA
8	Always oil the tools after washing or cleaning to avoid roasting	0.91	0.51	-3.30	NA
9	Hand gloves should worn when using tools	0.64	0.68	-9.16	NA
10	Approved motor vehicle tools should be used in the workshop	1.10	0.69	-2.93	NA
11	Report any damaged tool to the workshop officer	0.79	0.40	2.86	NA
12	Regular inspection of tools should be carried out	0.81	0.68	-1.65	A
13	Damaged tools should be removed from the workshop	0.51	0.53	1.39	A
14	Do not play with sharp tools	0.47	0.67	-1.69	NA
15	Avoid keeping tools carelessly after use to avoid injuries	0.64	0.40	1.90	NA

KEY

SD1= Standard deviation of automobile technology teacher
SD2= Standard deviation of automobile workshop supervisor

The result shown in table 4.6 above indicates the Comparism between automobile technology teachers and automobile workshop supervisor. Data revealed that items 1,3,5,12 and 13 has a calculated t-value less than the t-critical value of ±1.68, hence hypothesis for these items were upheld at 0.05 level of significance. Expect for item 2, 4, 6, 7, 8, 9, 10, 11 ,14 and 15 which has a t-calculated value above the t-critical value ±1.68, thus HO was not accepted for this items.

4.7 Hypothesis 2

There will be no significant different in the mean responses between automobile technology and automobile workshop supervisor on the industrial safety needed by MVM students in operating equipment and machine in automobile maintenance operation

Table 4.7: t-test analysis of the respondents of automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in operating equipment and machine in automobile maintenance operation in Niger State.

S/N	ITEMS	SD1	SD2	t-test	Remark
1	Protecting hands with gloves and wearing safety shoes when operating portable tools and machines	0.38	0.82	1.69	NA
2	Wear approved eye protector when operating a power tool.	0.44	0.93	-5.19	NA
3	Stop power tools or machines before cleaning activities or making any adjustment.	0.58	0.64	1.70	NA
4	Switch off the socket outlet before power tools or machine is connected.	0.50	0.67	-6.22	NA
5	Disconnect the power tool or machine immediately a strange sound is noticed.	0.58	0.87	1.84	NA
6	Test the power tool or machine for functionality before use.	0.61	1.10	0.87	A
7	Keep the body away from the rotating part of the power machine	0.77	0.75	0.00	A
8	Never adjust any power tool or machine while running	0.64	0.22	-2.46	NA
9	Check faults in the power tool or machines before re-use.	0.79	0.40	2.86	NA
10	Use brush to remove chips from drilling machine	1.01	1.00	-0.58	A
11	Concentrate on work while using power tool or machine	0.67	0.47	-1.69	NA
12	Use apron or overall while operating any power tool or machine.	0.64	0.40	1.90	NA
13	Report to the instructor any strange noise from the power tool or machine	0.71	0.30	3.44	NA
14	Stop operating power tool or machine if job is boring or when you get tired.	0.91	0.51	-3.30	NA
15	Remove coat and jacket, tie and roll up loose sleeves before operating any machine.	0.64	0.68	-9.16	NA

KEY

SD1= Standard deviation of automobile technology teacher
SD2= Standard deviation of automobile workshop supervisor
A= Accepted
NA= Not Accepted

The result shown in table 4.7 above indicates the Comparism between automobile technology teachers and automobile workshop supervisor. Data revealed that items 6,7 and 10 has a calculated t-value less than the t-critical value of ±1.68, hence hypothesis for these items were upheld at 0.05 level of significance. Expect for item 1,2,3,4,5,8,9,11,12,13,14 and 15 which has a t-calculated value above the t-critical value ±1.68, thus HO was not accepted for this items.

4.8 Hypothesis 3

There will be no significant difference in the mean response of automobile technology teacher and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation. Table 4.2.3: presents test of this hypotheses

Table 4.8: t-test analysis of the respondents of automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation in Niger State.

S/N	ITEMS	SD_1	SD_2	t-test	Remark
1	Avoid lifting materials from the floor while seated	0.38	0.82	1.69	NA
2	Never lift a heavy material over an obstacle alone	0.44	0.93	-5.19	NA
3	Lift a material in areas with adequate footing, space and lighting	0.58	0.64	1.70	NA
4	Do not left heavy object alone.	0.93	0.90	-0.56	A
5	Keep lifts between shoulders and knuckle height.	0.50	0.67	-6.22	NA
6	Use the right materials for the right job	0.62	0.80	-2.93	NA
7	Use conveyors, slides or chutes to eliminate pushing or pulling while handling a material.	1.05	0.87	2.63	NA
8	Do not stand or seat on a sharp material	0.93	0.98	0.54	A
9	Always use face mask and goggle when handling acidic materials	0.75	0.99	-1.94	NA
10	When moving material, attach handles or holders to loads.	0.93	0.99	-1.61	A
11	Always wear appropriate personal protective equipment when handling materials	0.50	0.67	-6.22	NA
12	Use proper lifting techniques to prevent injuries from oversize materials	0.85	0.92	-1.17	A
13	Keep feet apart to give a balanced and stable base when lifting a material.	0.57	1.72	-1.28	A
14	Ascertain intended path of movement is clear before lifting a material.	0.75	0.99	-1.94	NA

KEY
SD1= Standard deviation of automobile technology teacher
SD2= Standard deviation of automobile workshop supervisor
A= Accepted
NA= Not Accepted

The result shown in table 4.8 above indicates the Comparism between automobile technology teachers and automobile workshop supervisor. Data revealed that items 4,8,10,12 and 13 has a calculated t-value less than the t-critical value of ±1.68, hence hypothesis for these items were upheld at 0.05 level of significance. Expect for item 1,2,3,5,6,7,9,11 and 14 which has a t-calculated value above the t-critical value ±1.68, thus HO was not accepted for this items.

4.9 Hypothesis 4

There will be no significant difference in the mean response of automobile technology teacher and automobile workshop supervisor on the industrial safety skills needed by MVM students in overhauling of automobile engine

Table 4.9: t-test analysis of the respondents of automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in overhauling of automobile engine in Niger State.

S/N	ITEMS	SD_1	SD_2	t-test	Remark
1	Disassemble and re-assemble the automobile engine in correct sequence	0.61	1.10	0.87	A
2	Replace a bad automobile engine part with a good one	0.77	0.75	0.00	A
3	Carry out repairs of automobile engine according to manufacturers' specification	0.51	0.69	1.34	A
4	Perform all kinds of mechanical test on automobile engine before dissembling	0.44	0.40	-0.72	A
5	Trace faults in the automobile engine using appropriate tools and equipment.	0.68	0.40	0.00	A
6	Dismantle faulty units of an automobile engine carefully and correctly	1.01	1.00	-0.58	A
7	Interpret charts and service manuals of an automobile engine	0.59	0.47	-0.57	A
8	Replacing cut timing belt on an automobile engine with a new one before using	0.75	0.80	-1.99	NA
9	Inspecting drive belts on an automobile engine before using	0.51	0.74	-2.49	NA
10	Adjust drive belts on an automobile engine machine before using	0.92	0.85	1.15	A
11	Replace oil filters with new ones.	1.10	0.92	-1.00	A
12	Replace used engine oil with new one.	0.83	1.11	-1.61	A
13	Service carburetors correctly	0.79	0.40	2.86	NA
14	Interpret engine analyzer tests	0.67	0.47	-1.69	NA
15	Inspect and adjust automobile engine valves	0.64	0.40	1.90	NA

KEY
SD1= Standard deviation of automobile technology teacher
SD2= Standard deviation of automobile workshop supervisor
A= Accepted
NA= Not Accepted

The result shown in table 4.9 above indicates the Comparism between automobile technology teachers and automobile workshop supervisor. Data revealed that items 1,2,3,4,5,6,7,10,11 and 12 has a calculated t-value less than the t-critical value of ±1.68, hence hypothesis for these items were upheld at 0.05 level of significance. Expect for item 8,9,13,14 and 15 which has a t-calculated value above the t-critical value ±1.68, thus HO was not accepted for this items.

4.10 Hypothesis 5

There will be no significant difference in the mean response of automobile technology teacher and automobile workshop supervisor on the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation. Table 4.2.5: presents test of this hypotheses

Table 4.10: t-test analysis of the respondents of automobile technology teachers and automobile workshop supervisor on the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation in Niger State.

S/N	ITEMS	SD_1	SD_2	t-test	Remark
1	Employing of qualify personnel in handling practicals	0.80	0.57	-0.72	A
2	Provision of protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping	0.88	0.69	3.83	NA
3	Proper orientation on the basics of safety skills of motor vehicle mechanic students in technical colleges	0.42	0.74	-5.33	NA
4	Drifting of profession should be put into consideration specially in technical colleges	0.83	1.11	-1.61	A
5	Ensuring that approved protective wears are worn by students	0.91	1.51	-1.51	A
6	Facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges	1.10	0.92	-1.00	A
7	Relevant training on safety regarding motor vehicle mechanic students be put in place in technical colleges	0.75	0.80	-1.99	NA
8	Enforcing vision and mission of motor vehicle mechanic in technical colleges.	0.51	0.74	-2.49	NA
9	Regular evaluation of vision and mission of safety skills in technical colleges.	0.75	0.95	4.89	NA
10	Proper layout of workshop to show clearly carriage ways and location of machine tools	0.92	0.85	1.15	A
11	Organizing conferences/seminars regularly for technical teachers	1.10	0.92	-1.00	A
12	Organizing tools on the shelves and tool boxes based on the function they perform	0.64	0.40	1.90	NA
13	Creating committee that will set modalities/strategies for maintenance and decide penalties for MVM students who does not use safety equipment.	0.53	0.51	1.39	A
14	Motor vehicle mechanic students should belong to professional safety association like red cross, safety club etc.	0.81	0.68	-1.65	A

KEY

SD1 = Standard deviation of automobile technology teacher
SD2 = Standard deviation of automobile workshop supervisor
A = Accepted
NA = Not Accepted

The result shown in table 4.10 above indicates the Comparism between automobile technology teachers and automobile workshop supervisor. Data revealed that items 1,4,5,6,10,11,13 and 14 has a calculated t-value less than the t-critical value of ±1.68, hence hypothesis for these items were upheld at 0.05 level of significance. Expect for item 2, 3, 7, 8, 9, and 12 which has a t-calculated value above the t-critical value ±1.68, thus HO was not accepted for this items.

4.11 Findings of the study

The following are the principle findings of the study, they are organized based on the research questions and hypothesis.

1. There is need for industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation among them are selecting the right tools for the right job, using tools with a good handle, knowing the capacity of any tools before using it for any work, using insulated hand tools for auto electrical work and always return tools to the tool box after use.
2. There is need for industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation among them are wearing of approved eye protector when operating a power tool, always stop poer tools or machine before cleaning activities or making any adjustment, switch off the socket outlet before power tools or machine is connected, always disconnect the power tool or machine immediately a strange sound is noticed and testing the functionality of the power tool or machine before using.
3. There is need for industrial safety skills needed by MVM students in handling materials in automobile maintenance operation among them are Avoid lifting materials from the floor while seated, never lift a heavy material over an obstacle

alone, lifting a material in areas with adequate footing, space and lighting and using of conveyors, slides or chutes to eliminate pushing or pulling while handling a material

4. There is need for industrial safety skills needed by MVM students in overhauling of automobile engine among them are Disassembling and re-assembling the automobile engine in correct sequence, replacing a bad automobile engine part with a good one, carrying out repairs of automobile engine according to manufacturers' specification, performing all kinds of mechanical test on automobile engine before dissembling, dismantling faulty units of an automobile engine carefully and correctly, Inspecting drive belts on an automobile engine before using.
5. There are strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation among them are employing of qualify personnel in handling practicals, providing protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping, proper orientations on the basics of safety skills of motor vehicle mechanic students in technical colleges, drifting of profession should be put into consideration specially in technical colleges, ensuring that approved protective wears are worn by students, facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges, relevant training on safety regarding motor vehicle mechanic students be put in place in technical colleges.
6. There was no significant different in the mean responses between automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation.

7. There was no significant different in the mean responses between automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation.
8. There was no significant different in the mean responses between automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation.
9. There was no significant different in the mean responses between automobile technology teachers and automobile workshop supervisor on the industrial safety skills needed by MVM students in overhauling of automobile engine.
10. There was no significant different in the mean responses between automobile technology teachers and automobile workshop supervisor on the strategies for acquiring the industrial safety skill needed by MVM students in automobile maintenance operation

4.12 Discussion of the findings

The discussion of findings is based on the research questions posed for the study and the hypothesis. The findings in Table 1 related to research question 1 shows that majority of the items as regards to the extent in which industrial safety skills is needed by MVM students in handling tools and equipment in automobile maintenance operation in Niger state. The findings revealed that most of the safest ways of handling tools and equipment is just by using tools with a good handle, checking the sharpness of scribers, knowing the capacity of any tool before using it for any work, using insulated hand tools for auto electrical work etc. this helps to achieve a safe act of working with hand tools (Adah, 2017). This finding is in line with the work of Yakubu (2018) who stated that hand tools

do not usually cause accidents if they are in working order, used correctly, carried carefully and stored safely. The findings also were in consonance with the opinion of Nwachukwu (2018) who said that, available tools should be classified according to usage and they should be properly serviced before embarking on a new job. It is necessary therefore for MVM students to take adequate measures while carrying out any activity in the workshop.

The findings in Table 2 related to research question 2 revealed that respondents agreed with the majority of items on the extent to which industrial safety skills are needed by MVM students in operating equipment and machines in automobile maintenance operation in Niger state. The findings revealed that Protecting hands with gloves and wearing safety shoes when operating portable tools and machines, Wear approved eye protector when operating a power tool, stop power tools or machines before cleaning activities or making any adjustment, switch off the socket outlet before power tools or machine is connected, Disconnect the power tool or machine immediately a strange sound is noticed etc, is one of the safest ways of operating equipment and machines (Ali, 2020). The result is in line with Oranu, Nwoke and Ogwo (2017) that the users or operators of power machines and tools should always wear eye goggles when drilling machines. The result is also in agreement with Baba (2017) that operators should always wear face shield when using drilling machines and make sure that the switch is off before connecting drilling machine to source. It is therefore important that MVM students should wear and use certain materials to play safe in electrical installation workshop.

The findings in Table 3 related to research question 3 revealed that the respondents agreed with the majority of items on the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation in Niger state. The findings

revealed that most students are fully aware of the industrial safety skill in in handling materials in automobile maintenance operation which includes: Avoid lifting materials from the floor while seated, never lift a heavy material over an obstacle alone, lift a material in areas with adequate footing, space and lighting, do not left heavy object alone etc.

The findings in Table 4 related to research question 4 shows that majority of the items as regard the extent to which industrial safety skills are needed by MVM students in overhauling of automobile engine in automobile maintenance operation in Niger state. The findings revealed that the safest ways of overhauling automobile engines are by Disassemble and re-assemble the automobile engine in correct sequence, replace a bad automobile engine part with a good one, carry out repairs of automobile engine according to manufacturers' specification, perform all kinds of mechanical test on automobile engine before dissembling, Dismantle faulty units of an automobile engine carefully and correctly etc (Ekon, 2019).

The findings in Table 5 related to research question 5 revealed that the respondents agreed with the majority of items on the strategies for acquiring the industrial safety skill needed by MVM students in automobile maintenance operation. The findings revealed that Employing of qualify personnel in handling practicals, Provision of protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping, Proper orientation on the basics of safety skills of motor vehicle mechanic students in technical colleges, Drifting of profession should be put into consideration specially in technical colleges, Ensuring that approved protective wears are worn by students, Facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges, Relevant training on safety regarding motor vehicle mechanic

students be put in place in technical colleges, Enforcing vision and mission of motor vehicle mechanic in technical colleges, Regular evaluation of vision and mission of safety skills in technical colleges etc are some of the strategies for acquiring and improving industrial safety skills among MVM students in automobile maintenance operation (Igbo, 2021).

The implication of this findings revealed that when proper supervision, adequate training of teachers and students on safe practices in automobile maintenance operation, it will help to improve a safe working environment for our students.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter deals with summary, conclusion and recommendations based on the findings. Suggestions for further studies were also highlighted.

5.1 Summary of the Study

The research was conducted to investigate the industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Niger state. the study used a survey design method and sought to investigate the safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles Niger state. five research questions were formulated based on the purpose of the study, the literatures related to the study were also reviewed. A structured questionnaire was developed by the researcher. The instrument was in five sections and it was validated and used to get information from respondents. The population of the study was 105 automobile technologists, which are made up of 45 automobile technology teachers and 60 automobile workshop supervisors in Niger state. A total of 105 questionnaires were distributed with a 100% return rate.

Data collected on the structured questionnaire were analyzed using mean statistic. Safety skills needed by MVM students were discovered which includes with a good handle, checking the sharpness of scribers, knowing the capacity of any tool before using it for any work, using insulated hand tools for auto electrical work etc. this helps to achieve a safe act of working with hand tools, Protecting hands with gloves and wearing safety shoes when operating portable tools and machines, Wear approved eye protector when operating a power tool, stop power tools or machines before cleaning activities or making any adjustment, switch off the socket outlet before power tools or machine is connected,

Disconnect the power tool or machine immediately a strange sound is noticed is one of the safest ways of operating equipment and machines etc. that Employing of qualify personnel in handling practicals, Provision of protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping, Proper orientation on the basics of safety skills of motor vehicle mechanic students in technical colleges, Drifting of profession should be put into consideration specially in technical colleges, Ensuring that approved protective wears are worn by students, Facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges, Relevant training on safety regarding motor vehicle mechanic students be put in place in technical colleges, Enforcing vision and mission of motor vehicle mechanic in technical colleges, Regular evaluation of vision and mission of safety skills in technical colleges are the strategies for improving and acquiring safety skills.

5.2 Implications

From the result gotten from the analysis of data, some implications of the study have been revealed. The automobile technology teachers and workshop supervisor are now aware of the industrial safety skills, the level of implementation of industrial safety skill acquired by MVM students in minna Niger State and the ways of sensitizing MVM students for effective automobile maintenance operation in minna Niger State. Automobile technology teachers and automobile workshop supervisor will be able to state out the strategies to be carried out to ensure MVM students compliance to safety practices in automobile workshop. The Proper management of automobile workshop will be able to save money in regards to the provision of wasted materials, damaged tools and equipment which occurs as a result of accidents in the automobile workshop. This will also reduce the cost of expenses on the supply of first aid and consumable if there is adequate assessment and health management practices in the workshop.

5.3 Contributions to Knowledge

The findings of this study will contribute a lot by providing information to MVM teachers and automobile workshop supervisors on the techniques to adapt in motivating their students interest towards industrial safety skills for effective maintenance of automobiles needed by their learners. The findings will also encourage collaboration effort between the state government, Technical curriculum planners, Automobile teachers and the students to overcome the current challenges affecting motor vehicle mechanic student's safety skills development in motor vehicle mechanic trade in Technical Colleges and tertiary institution in Niger State. The findings will also encourage collaboration effort to adopt the mechanisms that will improve motor vehicle mechanic student's industrial safety skills development in motor vehicle mechanic trade in Technical Colleges and tertiary institution in Niger State.

5.4 Conclusion

Automobiles, are used primarily on the public roads but adaptable to other surfaces. Conclusively programs should be developed to train automobile technology teachers and automobile workshop supervisor on automobile hazards and safety. MVM students Should be trained on programs with books, videos sideshows, weekly meetings and classroom based sessions. These methods of learning are passive in nature. Passive methods of training are not engaging and may not maximize knowledge acquisition and retention, especially for more complex tasks (Fisher, 2020). What we need very simply, is a rhyme for automobile permeated on the radio and TV, in the newspaper and magazines and in big letters on high traffic zone billboard. There is nothing much to be done in this regard. We just have to spread awareness in our own homes and society at

large. We can only accomplish a huge target by just understanding the significance of power and its usage thereby reducing its wastage.

5.5 Recommendations

Based on the findings of this study and their implications, the following recommendations have been taken into consideration.

1. Safety skills should be included in the curriculum of automobile technology at technical college level.
2. Workshop/seminars should be regularly organized for automobile technology teachers and automobile workshop supervisor to acquaint them with the safety skills required by MVM students for safe workshop practice and in automobile maintenance operation.
3. The National Board for Technical Education (NBTE) should incorporate safety skill in the automobile technology curriculum as well as in the regulatory or quality assurance programme.
4. Safety skills should be taught as a separate course or subject in automobile technology trade in technical colleges in Nigeria to give it the prime importance it deserves.
5. Teachers should receive a standard training on safety skills and the use of safety equipment.

5.6 Suggestions for Further Research

The following suggestions were made for further research.

1. Development and validation of safety skills modules in automobile technology trade should be carried out.

2. Effect of safety skills on students' interest and performance in automobile in technical colleges in Nigeria should be conducted.

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APPENDIX A

Department of Industrial and Technology Education
School of Science and Technology Education
Federal University of Technology minna, Niger State.
Date…….

Dear Sir,

REQUEST FOR VALIDATION OF RESEARCH INSTRUMENT

I am an under graduate student of the department of industrial and technology education (automobile technology), school of science and technology education, Federal University of Technology Minna, currently undertaking a research project aimed at identifying **industrial Safety Skills Needed by Technical College Motor Vehicle Mechanic Students for Effective Maintenance of Automobiles in Niger State.**

Kindly read the attached questionnaire and assess its validity, your comments and suggestions that could enhance the validity of the instrument and also improve the quality of the instrument will be highly appreciated. I count on your co-operation while thanking you in anticipation

Yours Faithfully

Ibrahim Jibrin Ibrahim
2018/3/74381TI
Researcher

APPENDIX B

RESEARCH QUESTIONNAIRE ON

INDUSTRIAL SAFETY SKILLS NEEDED BY TECHNICAL COLLEGE MOTOR VEHICLE MECHANIC STUDENTS FOR EFFECTIVE MAINTENANCE OF AUTOMOBILES IN NIGER STATE.

PART ONE

Please, complete the questionnaire as faithfully and sincerely as possible by ticking the column that best represent your perception about the above topic: the questionnaire is for research purpose and your view will be treated confidently.

Category: Automobile technology teachers ☐ Automobile workshop supervisor ☐

Guide on how to respond to the questionnaire: use the following rating scale to indicate your opinion by ticking the phase that best describe your level of agreement to the items

For research question 1 to 4, the response options are:

Highly needed	(HN)	=	4 points
Needed	(N)	=	3 points
Moderately Needed	(MN)	=	2 points
Not Needed	(NN)	=	1 point

For research question 5, the response options are:

Strongly Agree	(SA)	=	4 points
Agree	(A)	=	3 points
Disagree	(D)	=	2 points
Strongly Disagree	(SD)	=	1 point

PART TWO
SECTION A
RESEARCH QUESTION 1

What are the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation?

S/N	ITEMS	HN	N	MN	NN
1	Selecting the right tools for the right job				
2	Using tools with a good handle always				
3	Checking the sharpness of scribers, spanners, and screwdrivers before use.				
4	Knowing the capacity of any tool before using it for any work.				
5	Using insulated hand tools for auto electrical work				
6	Give a tool to colleague through the handle.				
7	Always return tools to the tool box after use				
8	Always oil the tools after washing or cleaning to avoid roasting				
9	Hand gloves should worn when using tools				
10	Approved motor vehicle tools should be used in the workshop				
11	Report any damaged tool to the workshop officer				
12	Regular inspection of tools should be carried out				
13	Damaged tools should be removed from the workshop				
14	Do not play with sharp tools				
15	Avoid keeping tools carelessly after use to avoid injuries				

SECTION B

RESEARCH QUESTION 2

What are the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation?

S/N	ITEMS	HN	N	MN	NN
1	Protecting hands with gloves and wearing safety shoes when operating portable tools and machines				
2	Wear approved eye protector when operating apower tool.				
3	Stop power tools or machines before cleaningactivities or making any adjustment.				
4	Switch off the socket outlet before power tools ormachine is connected.				
5	Disconnect the power tool or machine immediately astrange sound is noticed.				
6	Test the power tool or machine for functionalitybefore use.				
7	Keep the body away from the rotating part of thepower machine				
8	Never adjust any power tool or machine whilerunning				
9	Check faults in the power tool or machines beforere-use.				
10	Use brush to remove chips from drilling machine				
11	Concentrate on work while using power tool ormachine				
12	Use apron or overall while operating any power toolor machine.				
13	Report to the instructor any strange noise from the power tool or machine				
14	Stop operating power tool or machine if job is boringor when you get tired.				
15	Remove coat and jacket, tie and roll up loose sleevesbefore operating any machine.				

SECTION C
RESEARCH QUESTION 3

What are the industrial safety skills needed by MVM students in handling materials in automobile maintenance operation?

S/N	ITEMS	HN	N	MN	NN
1	Avoid lifting materials from the floor while seated				
2	Never lift a heavy material over an obstacle alone				
3	Lift a material in areas with adequate footing, space and lighting				
4	Do not left heavy object alone.				
5	Keep lifts between shoulders and knuckle height.				
6	Use the right materials for the right job				
7	Use conveyors, slides or chutes to eliminate pushing or pulling while handling a material.				
8	Do not stand or seat on a sharp material				
9	Always use face mask and goggle when handling acidic materials				
10	When moving material, attach handles or holders to loads.				
11	Always wear appropriate personal protective equipment when handling materials				
12	Use proper lifting techniques to prevent injuries from oversize materials				
13	Keep feet apart to give a balanced and stable base when lifting a material.				
14	Ascertain intended path of movement is clear before lifting a material.				

SECTION D
RESEARCH QUESTION 4

What are the industrial safety skills needed by MVM students in overhauling of automobile engine?

S/N	ITEMS	HN	N	MN	NN
1	Disassemble and re-assemble the automobile engine incorrect sequence				
2	Replace a bad automobile engine part with a good one				
3	Carry out repairs of automobile engine according tomanufacturers' specification				
4	Perform all kinds of mechanical test on automobile engine before dissembling				
5	Trace faults in the automobile engine using appropriate tools and equipment.				
6	Dismantle faulty units of an automobile engine carefully and correctly				
7	Interpret charts and service manuals of an automobile engine				
8	Replacing cut timing belt on an automobile engine with a new one before using				
9	Inspecting drive belts on an automobile engine before using				
10	Adjust drive belts on an automobile engine machine before using				
11	Replace oil filters with new ones.				
12	Replace used engine oil with new one.				
13	Service carburetors correctly				
14	Interpret engine analyzer tests				
15	Inspect and adjust automobile engine valves				

SECTION E
RESEARCH QUESTION 5

What are the strategies for acquiring the industrial safety skill by MVM students in automobile maintenance operation?

S/N	ITEMS	SA	A	D	SD
1	Employing of qualify personnel in handling practicals				
2	Provision of protective equipment such as hand gloves/paddling to reduce frictional effects of forceful griping				
3	Proper orientation on the basics of safety skills of motor vehicle mechanic students in technical colleges				
5	Drifting of profession should be put into consideration specially in technical colleges				
6	Ensuring that approved protective wears are worn by students				
7	Facilities for the training of motor vehicle mechanic students on safety should be made available in various technical colleges				
8	Relevant training on safety regarding motor vehicle mechanic students be put in place in technical colleges				
9	Enforcing vision and mission of motor vehicle mechanic in technical colleges.				
10	Regular evaluation of vision and mission of safety skills in technical colleges.				
11	Proper layout of workshop to show clearly carriage ways and location of machine tools				
12	Organizing conferences/seminars regularly for technical teachers				
13	Organizing tools on the shelves and tool boxes based on the function they perform				
14	Creating committee that will set modalities/strategies for maintenance and decide penalties for MVM students who does not use safety equipment.				
15	Motor vehicle mechanic students should belong to professional safety association like red cross, safety club etc.				