EFFECT OF FIELD TRIP ON STUDENTS ACADEMIC ACHIEVEMENT AND INTEREST IN METALWORK IN TECHNICAL COLLEGES IN NIGER STATE.

BY

OLADAYO FIKAYO MERCY

2017/3/68142TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA.

AUGUST, 2021

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A RESEARCH PROJECT SUBMITTED TO THE

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DECLARATION

I, OLADAYO FIKAYO MERCY, with matriculation number 2017/3/68142TI, 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.

OLADAYO FIKAYO MERCY
2017/3/68142TI

_____
Signature and Date

CERTIFICATION

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

Prof. R. O. Okwori	...……..
Project Supervisor	Sign & Date
Dr. I. Y. Umar	……
Head of Department	Sign & Date
……	……..
External Examiner	Sign & Date

DEDICATION

This project is dedicated to God for his sufficient Grace and my loved ones for their relentless support during this program.

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The researcher's sincere gratitude goes to God Almighty and his Spirit that guide me in the course of this research work. My sincere appreciation goes to my parents Mr. and Mrs Oladayo especially Mr Oladayo for his boundless love in cash and in prayer, his dedication towards my education. The researcher humbly appreciate the Projector Supervisor, Prof. R. O. Okwori for guiding me alright, Mal. Aliyu Mutaspha for his relentless help, advice, contributions and correction during the course of this research work, Mr Abutu Francis and all the lecturers in Industrial and Technology Education Department.

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ABSTRACT

This study was carried out to determine the effects of field trip on Students' Academic Achievement and Interest in Metalwork Technology in Technical Colleges in Niger State. The study adopted a mixed research design. This study was carried out in Chanchaga and Bida Local Government Area of Niger State. The population for the study comprised 100 TC II students from 2 technical colleges in Niger State. Mixed research design was adopted for the study and intact classes were used for the study. 50 TC II students in GTC Minna constituted the experimental group assigned to field trip method of teaching while 50 TC II students in GTC Eyagi-Bida are the control group assigned to conventional method of teaching. Two sets of instruments; General Metalwork Achievement Test GMWAT) and 15 items General Metalwork Interest Inventory (GMWII) were used for data collection. The instruments were subjected to face and content validation by three experts. The reliability of the GMWAT was established using Kuder Richardson 20 (KR 20) formula in which a coefficient of 0.86 was obtained while Cronbach Alpha was used in determining the reliability coefficient of ALSII which was found to be 0.84. The data collected from the pretest and posttest using GMWAT and GMWII were analyzed using mean and standard deviation for answering the research questions while analysis for covariance (ANCOVA) was used for testing the hypotheses at 0.05 level of significance. The study found among others, that the field trip and conventional learning method significantly increased academic achievement of the TC II students in general metalwork achievement test. Although, the achievement mean score of students exposed to field trip method of teaching was greater than that of conventional learning method of teaching in technical colleges in Niger State. The study also find out that gender of the students did not have much effect on the student' achievement in general metalwork achievement test in relation to the treatments given in technical colleges in Niger State, the interest of students exposed to field trip learning method of teaching was greater than that of conventional learning method of teaching in technical colleges in Niger State. There is no significant effect of field trip on students' achievement in learning of the metalwork technology. Based on these findings, the study among others, recommended that, a replica of the study in other schools should be adopted and that teachers should adopt field trip method of teaching in general metalwork in technical colleges. The replica of this study would provide a source for a larger overview of the conclusions drawn from the findings of this study.

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1.0 INTRODUCTION

1.1 Background to the Study

Nigerian Technical Colleges are educational institutions created with the purpose of training pupils to acquire appropriate vocational skills, attributes, knowledge, habits of thoughts and qualities of character that help the pupils develop their intellectual, physical, emotional, social and economic capabilities, contribute to economic growth, become self-reliant and development of their nations. Technical colleges are different from other secondary school; the reason is that it focus more on vocational education and skills acquisition rather than how to read and write only (Okolie, 2014).

Furthermore, Technical Colleges give training and teaching in vocational and technical subjects such as basic technology, commerce, applied science and other applied learning fields which are relevant to the development of the society in the areas of industrial, commercial and vocational agriculture. Technical curricula are prepared in basis and trade modules that are made up of major components (Ede & Olaitan, 2019). The major components of the Technical Colleges as designed by the Federal Republic of Nigeria (FRN, 2013) include;

i) The formation of an environment that provides opportunities for student to develop attitudes, awareness, skills and values to the practical work setting. This includes being responsible for sustaining hard tie with a range of agriculture, business and industry-related areas (General Education).

ii) The knowledge about almost every part of the work student/trainee will go into, and also have knowledge of how student will likely perform in the career (Theory and Related Courses).

iii) Train learners on necessary stages of capabilities (Workshop Practice), to be equipped, be able to carry out unified function within and without manufacturing or business fields efficiently within a variety of job or career settings (Industrial Training/Production Work).

iv) Develop skill that enable graduates create wealth; create employment and be self-reliant (Small Business Management and Entrepreneurial Training). The quality of manpower resources is responsible for the country's economic and social development.

The Nigeria Technical Colleges are training grounds for individual to acquire technical awareness and useful skills necessary for mastering a particular trade. In addition to general education, all the vocational and technical subjects offered by Technical Colleges are in two parts; theory and practice (Okolie, Igwe & Elom, 2019). The vocational and technical subjects offered in Technical Colleges include; furniture making, painting, automobile mechanics, electrical and electronics repairs and installations, carpentry and joinery, plumbing, woodworking, welding and fabrication.

Welding and fabrication is a branch of metalwork technology that is used for joining metallic parts usually through the application of heat. The method used for effective teaching and learning is a serious concern. Fabrication and welding is a skill based programme designed to equip the trainee with knowledge, attitude and skill to carry out sheet metalwork, gas welding, arc welding and cutting job on all type of metals and produce simple finished structural steel work project (NBTE 2011).

Teaching methods are tools used by teachers to impart knowledge and competencies to students. Teaching method is the active learning guidelines which provide sample activities that

facilitate active learning (Yin, 2013). These methods are said to be effective only when they are able to enhance student skills acquisition within the required possible duration of training. There are several teaching methods used in technical colleges such as demonstration, discussion, lecture and field trip.

According to Obeka (2010), field trip is a type of learning exercise carryout by teachers and students in a particular area of a subject to provide the learner with the opportunity to acquire knowledge. A field trip is allowing the students to make relevant observations and also obtain specific knowledge outside the classroom or school environment. In addition, Aliyu (2018) notices that field trip is bringing students out of the classrooms to places where they can see concrete illustration of classroom theories. It is on this background requires the use of basic scientific skills which is observation, identification, classification and manipulation of subject in the natural environment. A field trip is a journey by a group of people to a place away from their normal school environment. The purpose of the field trip is usually for observation and to provide students with experience outside their everyday school activities (Greene, Jay & Brain, 2015). Consequently, the field trip lay the foundation of how the students communicate and learn with each other for increasing learning achievement.

Student achievement indicates academic performance in school subject as represented by a score. Achievement according to Bakare (2012) is the outcome of level of accomplishment in a specified programmed of instruction in a subject area or occupation which a student undertaken in the recent past. Academic achievement of student is the translation of the students' performance in achievement test into scores obtained in a cognitive test. Jimoh (2018) stated that students' academic achievement connotes performance in school subject as symbolized by a

score or mark on an achievement test. Ogwo and Oranu (2016) emphasized that unless the teacher stimulates students' interest in learning, student academic achievement will be minimal.

Interest is therefore the persisting tendency to pay attention and enjoy some activities. Chukwu (2012) viewed interest as emotionally oriented behavioral trait which determines a student's vigor in dealing with educational programmes or other activities. Interest is a powerful motivational process that energizes learning and guides academic and career trajectories (Renniger & Hidi, 2016). Interest is both a psychological state characterized by increased attention and effort, experienced in a particular moment (situational interest), as well as an enduring predisposition to reengage with a particular object or topic over time (individual interest) (Hidi & Renniger, 2016). Although, the method of teaching has also contributed to how student generate interest in metalwork technology.

Field trip as a method of teaching helps to bring an effective learning of metalwork across gender. Field trip is an interactive strategy which gives both female and male equal opportunity to widen their practical and cultural experiences by varying their learning environment. Simpiri (2015) stated that in Nigeria, technical education and training of both men and women is very vital for the overall development of the society. However, in Nigeria, women constitute the majority of the unskillful adults. Gender is a sense of awareness of being male and female. Colman (2013) described gender as a behavior pattern and attitude perceived as masculine within a culture. Gender schema tends to relate most of the vocational trades to the masculine than feminine gender. The enrolment of female in technical colleges is significantly fewer than male counterparts. Onele (2014) therefore explained that teaching and learning of metalwork technology at technical colleges also demands effective use of instructional techniques in order to maintain gender balance and good academic achievement. The study

therefore, looked at how field trip method of teaching will have effect on metalwork student academic achievement and interest.

1.2 Statement of the Problem

In Technical Colleges, metalwork trade is one of the trades offered by technical college students in Nigeria. In spite, the investment by government on technical college programme, there is high percentage failure rate by metalwork students, National Business and Technical Education Board (2015-2017) Chief Examiner reports. The Federal Ministry of Education (FME) (2017) has observed that some of the factors responsible for the high failure rate of technical college students in NABTEB examinations particularly in the metalwork technology trade include among others, poor quality of teaching staff and teaching methodologies in the technical colleges. Sonola (2017) stated that traditional teaching methods such as lecture and discussions adopted for teaching in technical colleges by technical teachers are termed to be teacher-centered method instead of students-centered and these methods of teaching metalwork technology discourage creativity and disallow students from thinking beyond what is presented to them by their teachers. It has observed that the lecture method and demonstration method are the main teaching methods employed by technical teachers for implementing the curriculum.

Obviously, the adoption of only teacher centered methods of teaching result into ineffective use of varieties of instructional method and facilities and inability of teachers to effectively implement the curriculum to naturally increase student's interest and involvement in learning. The short coming in the teacher centered method of teaching could be responsible for poor academic achievement of Metalwork student in public examinations (NABTEB, 2013). Therefore, this study is designed to investigate the effect of field trip on students' academic achievement and interest in metalwork technical colleges in Niger State.

1.3 Purpose of the Study

The main purpose of this study was to investigate the effect of field trip on students' academic achievement and interest in metalwork in technical colleges in Niger State. Specifically, the study will determine the effect of:

i. Field trip on students' academic achievement taught metalwork in technical colleges, Niger State.
ii. Gender on technical college Metalwork students' achievement when taught using field trip method of teaching.
iii. Field trip on technical college students' interest in Metalwork.

1.4 Significance of the Study

The findings of this study would be of great benefit to policymakers, researchers, technical college students, metalwork industries, the society and the nation at large. The outcome of the study would be beneficial to the policymakers in planning and reviewing the curriculum content of Metalwork as well as decision making in educational matters. If contents are observed to be better taught with this method, then it will be mandated to the policy for the implementers. The findings of this study will be one of the references for other researchers to get information about teaching through field trip. It is also expected that this study would overcome difficulties of technical college students in understanding abstract contents and help improve their performance. This will enable the technical college student to be self-assured and function well, later in higher institutions. The researchers will also expand in knowledge and acquire experiences in the course of this study.

The findings of this study if found to have positive effect and implemented will benefit the technical college students by becoming creative, social, self-confident and self reliant. The

student will graduate with adequate skills and knowledge in metalwork technology to set up their workshop and earn a living. Those who want to further their education will have abilities and knowledge to do so. These students will also acquire skills such as collaborative, problem solving, and higher order thinking skills require for job performance in 21st century.

The metalwork industries will benefit from the findings of the study if implemented by having skilled and knowledgeable metalwork technology workers for better workplace performance.

The society at large and the nation in particular will also be a beneficial from this study. This is because a well-equipped metalwork trade graduate contributes their knowledge and skills in their various institutions and to the technological development of this nation.

1.5 Scope of the Study

This study was delimited to the Effects of Fieldtrip on the Students' Academic Achievement and Interest in Metalwork in technical colleges in Niger state. Specifically, the study covered fieldtrip, achievement, interest and gender influence in achievement and interest using fieldtrip method of teaching in metalwork in teaching lathe machine. The study will not cover other method of teaching and retention in metalwork because the focus of this study is on fieldtrip method of teaching.

1.6 Research Questions

The following research questions will be answered in the study.

i) What is the effect of fieldtrip on metalwork students' academic achievement?

ii) What is the effect of gender on technical college metalwork students' academic achievement when taught using field trip method of teaching?

iii) What is the effect of field trip on metalwork technical college students' interest?

1.7 Hypotheses

The following null hypotheses are formulated to guide the study and tested at 0.05 level of significance.

$HO_{1;}$ There is no significance difference between the mean academic achievement score of metalwork students' taught using fieldtrip method of teaching and those taught with conventional method.

HO_{2}; There is no significance difference in the academic achievement of male and female students taught using field trip method of teaching as measured by pre-test, post-test mean scores.

$HO_{3;}$ There is no significance difference in the interest of metalwork student taught lathe machine using field trip method of teaching.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

2.1.0 Piaget's Development Theory of Learning and Thinking

The Piaget's Development Theory of Learning and Thinking was propounded by Swiss developmental psychologist Jean Piaget between the years (1896-1980). The theory deals with nature of knowledge itself and how humans gradually come to acquire, construct and use it. Field trip can be considered one of the avenues through which science and technology can be taught; through formal classroom teaching and practical work. The theoretical basis for field trip was Piaget's (1952) development theory of learning and thinking 'that the child should be able to explore his environment for effective learning'. A central component of Piaget's (1952) developmental theory of learning and thinking is involving the participation of the learner. He said that knowledge is not merely transmitted verbally but must be constructed and reconstructed by the learner. Piaget's said that for a child to know and construct knowledge of the world that child must act on objects and it is this action which provides knowledge of the objects, the mind organizes reality and act upon it (McLeod, 2015).

The students are exposed to basic concepts to discover things for themselves. This could be through field work and practical orientation by technology educator and learner. Obeke (2010) supported this view that during field trip the learners observe the different rock sample to be able to appreciate the characteristics and features of rock so as to differentiate the rock into sedimentary, metamorphic and igneous rocks. In considering field trip method of teaching, experience and the learner environment should be paramount. It involves learning by active

participation between the learner and his environment. The experience involves in field trip method of teaching are learning by active participation (doing), problem solving and practical work which is in tune with pragmatist theory.

2.1.1 Dewey Experiential Learning Theory

Learning by doing is a key concept and has a long history in experiential learning. David Kolb is recognized as the founder of experiential learning theory in 1975, although, John Dewey laid significant groundwork for the theory in his book, Experience and Education (1938). Dewey stressed the important of experience in education; ‘there is an intimate and necessary relation between the process of actual experience and education. John Dewey theory stated that a student should have opportunities to take part in their own learning. He believed that student would succeed in environment where they are able to interact and learn through experience (Talebi, 2015).

According to Dewey, Education must be conceived as continuing reconstruction of experience, the process and goal of education is one and the same thing. Based on his work, Dewey and some other notables theorists such as Kurt Lewin, Jean Piaget, Carl Rogers and Williams James experiential learning theory emerged (Kolb & Kolb, 2015). As below experiential learning theory can be conceptualized as a process with several components; student have an experience (concrete observation), reflect on observation about that experience (reflective observation), analyze responses and formulate new ideas (abstract conceptualization) and then actively test these new ideas in new situations (active experimentation). This process is a continual cycle with increasing complexity (Kolb & Kolb, 2015).

Experiential learning is a teaching strategy that provides concrete experience to learner to aid their understanding of content, concepts and ideas. Experiential learning facilitates students' deeper understanding of content (McAuliffe, 2011). In form of field trips, experiential learning has helped the student to transfer previous knowledge and acquire new knowledge (Jordan, 2012). This theory using field trip help the student gain valuable skill outside the classroom (Vieira, 2012). Dewey thought that school should be representative of real-life situation, allowing the student to participate in learning activities (Flinder & Thornton, 2013).

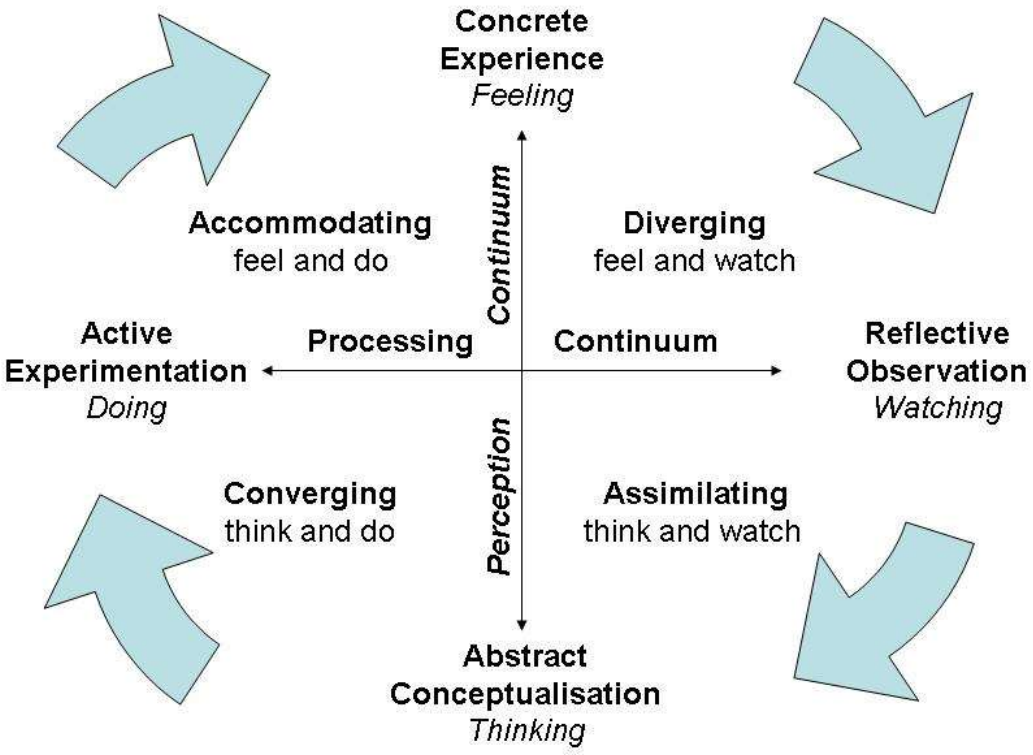

Fig 1: Kolb's Learning Cycle

Source: - (Kolb & Kolb, 2015)

2.2 Conceptual Framework

2.2.1 Technical Colleges in Nigeria

Technical colleges are post primary institutions equivalent to senior secondary schools. Kazaune (2018) stated that technical colleges are charged with the production of craftsmen and technicians. Technical colleges according to Okoro (2016), are regarded as the principal vocational institutions in Nigeria that give full vocational training intended to prepare students for entry into various occupations as operatives or artisans, craftsmen and advanced craftsmen. According to Eze (2013), technical college in Nigeria is established to prepare individuals for employment in recognized employment. Technical colleges trained both males and females in the areas of electronics technology, electrical technology, mechanical/auto mechanics technology, building and construction technology and metalwork technology. Technical colleges admit junior secondary school graduates as their intake. Technical college regards the development of cognitive, psychomotor and effective domain as essential. Technical college trains and produce technician for industries, impact vital technical skill in the student and help the student to be self employed. Though in technical college, student acquire skill and become skilled technicians in the area of woodwork, auto mechanic, bricklaying and concreting, mechanical craft, electrical installation and metalwork technology (Yaro & Haruna, 2018).

Recognizing the value of the importance of technical and vocational education, the Federal republic of Nigeria (2004) in her National policy on Education stressed in article 40 that: "Technical and vocational education should be used as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life". The Federal

Republic of Nigeria further stressed the goals of technical and vocational education in article 42 of the National Policy on Education to include among others. a) Provide trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical levels; b) Provide the technical knowledge and vocational skills necessary for agricultural, commerce and economic development; c) Give training and impart the necessary skills to individual who shall be self-reliant economically. The master plan (2001-2010) stressed that technical colleges are expected to produce craftsmen. According to the Federal republic of Nigeria (2004) in the National Policy on Education, the following trades are offered in technical colleges:

i. Computer Craft Practice: This trade comprises of computer maintenance work; and data processing.

ii. Electrical Engineering Trades: These trades include: electrical installation and maintenance; radio, television and electrical work; and appliances repair.

iii. Building Trades: This involves block laying, bricklaying and concrete work; painting and decorating; and plumbing and pipe-fitting.

iv. Wood Trades: Wood trades comprise of machine; carpentry and joinery; furniture making and upholstery.

v. Hospitality: Under hospitality, the trade is catering and practice.

vi. Textile Trades: Textile trade include: garment making (ladies/men dresses); textile trades; and dyeing and bleaching.

vii. Printing Trades: These trade include: printing craft practice : graphics arts; and ceramics.

viii. Beauty Culture Trades: These trades include cosmetology.

ix. Business Trade; These trades include; stenography; typewriting; store keeping; book keeping and office practice. The programmes in the colleges were designed to train craftsmen and artisans for the economy. The programmes were also designed to produce individuals who would not only be craftsman and artisans, but also knowledgeable about the role of technology and the environment in which they live.

x. Mechanical Trades: The trade comprises of agricultural implements and equipment 'mechanics' work; automobile engineering practice; air-conditioning and refrigeration; mechanical engineering craft practice; instrument mechanics work; marine engineering craft; foundry craft practice; and metalwork.

2.2.2 Metalwork Technology in Technical Colleges

Metalwork technology according to the Federal Government of Nigeria (FGN) 2014) is a vocational subject offered at the senior secondary schools and technical college's level for the purpose of students to acquire further knowledge and develop skills. It expose students to career opportunity by exploring usable options in the world of work, and enable youths to have an intelligent understanding of the increasing complexity of technology. Metalwork technology is one of the major programme offered in technical college. Danjuma and Umaru (2019) stated that Metalwork is the process of making an object out of the metal. Hornby (2011) define metalwork technology as the application of scientific knowledge in the activity of making objects out of the metal in an artistic and skillful way. Ombugus (2013) also stated that metalwork technology curricular in technical college aim to teach the learner how to practice the trade independently after graduation.

In order to achieve the aim and objectives of the metalwork technology, the teaching method been used is very essential and important. In vocational and technical education,

teaching methods and techniques are aimed at developing in the learners, the ability to acquire the knowledge and skills useful for work. These methods and techniques can vary in depth and time, depending on the level of students and the materials available for instruction.

2.2.3 Teaching Methods in Technical Colleges

According to Nwachukwu (2011) the task of organizing effective teaching is crucial in any educational setting. The crucial decisions at all instructional levels of the organization will be centred on factors as what to teach, when to teach and how to teach it. These decisions are made by the teacher and a good insight and understanding of the decisions will assist the teacher greatly in developing a good plan for teaching. At the classroom level Nwachukwu (2011) maintained that how to teach the selected elements depends on the teacher and the teaching methods. In vocational and technical education, Nwachukwu pointed out that teaching methods and techniques aim at developing in the learner the ability to acquire the knowledge and skills useful for work. Teaching methods are used by all teachers to present skills, knowledge and appreciations to the learners in the classroom and to engage learners in the tasks involved while teaching techniques are processes adopted by veteran teachers to inject variety, in their teaching, stimulate it and maintain the learners' interest in it (Ogwo & Oranu, 2016). They maintained that instructional techniques are subsumed in teaching methods as ancillaries or adjuncts to ensure the effectiveness of the method. A comprehensive study of available literature in vocational and technical education reveal extensive listings of teaching methods as conceived and classified by various authors.

The lecture method involve a formal discourse or exposition on a subject matter to attain a stated instructional objective, the teacher does the talking while the learners listen and occasionally take notes (Ukoha & Eneogwe, 2016). According to Okoro (2012) in lecture

method the teacher or some other knowledgeable person supplies information to the students. Awotua and Efebo (2012) explained that lecture method is a teaching method whereby the teacher transmits information (subject matter and content) verbally to the students. Sometimes it involves writing on the chalkboard or using instructional materials. The students listen and take notes of facts that are considered important; sometimes the students are allowed to ask questions for clarification. Lecture method according to Ukoha and Eneogwe (2016) encourages self study and research; the method is convenient for teaching large number of students at the same time, it is useful to cover a considerable amount of lesson content in a very short time. It is essential for setting out course objectives, providing explanations and analyzing relevant aspect of a course of study, and finally using the lecture method, the learners develop communication skills such as note taking, listening and summary writing.

Nwachukwu (2011) contend that good teaching always provides for a two-way communication between the teacher and the students and for this reason other methods such as demonstration are more effective than the lecture method in many situations. However, Nwachukwu said that short talks and verbal explanations are common and necessary in all practical instruction. Thus, lecture method is not the most effective method for promoting student thought, changing attitudes or teaching behavioural skills (Armstrong, 2012).

The project method is also one of the methods which are predominantly used in teaching in technical colleges schools. The project method at the same time is one of the standard teaching methods in vocational and technical education. It is a means by which students develop independence and responsibility, and practice social democratic modes of behaviour (Ericson, 2016). Project method of teaching is suitable for large group, small group and individual instruction (Ukoha & Eneowe, 2016). Ukoha and Eneogwe, explained that the project method

originated in the early twentieth century. It was greatly influenced by Dewey's problem method of teaching. The underlying principle of the method according to them is that learning takes place through direct contact with materials. Project method is a very effective approach that allows the students to throw out opinions about the topic covering their field of interest, to ask question, develop theories, estimate and use of skill acquired in this content to solve real-life problem (Chad, 2010). A project method according to Nwachukwu (2011) implies a practical problem, which a student and the teacher plan to execute. The planning and the executing must be concrete in nature. It should involve the design, arrangement of materials, availability of equipment and tools and a good environment for the activity. On the part of the teacher, the teacher must have an excellent understanding of the individual after learning has taken place. The execution should meet the following objectives; to encourage the individual; to assist the individual and to direct the individual for specific changes.

Similarly, Ukoha & Eneogwe stated that a project is a learning activity selected, planned, designed and executed by learners collectively or individually to clarify facts, acquire new knowledge, skills, appreciation and to solve identified problems under the teacher's guidance and supervision. They asserted that whether group or individual project there must be a clearly stated purpose to be achieved by the group or individual. The effectiveness of any project depends on its purpose and usefulness. Knoll (2014) added that project has four phases; purpose, planning, executing and judging. The ideal progression is when all the four phases are initiated and completed by the students. Knoll emphasized that Kilpatrick (one of the proponents of project method) believed in Thorndike's law of learning that an action for which there existed and "inclination" procured "satisfaction" and was more likely to be repeated than an action that is "annoyed" and took place under "compulsion". Therefore, he maintained that the role of teacher

in providing guidance and direction to the students should not be completely eliminated. This is because it is true that students tend to exaggerate their power of execution and to select project that beyond them. The danger is that students' produce crude project and this will defeat the purpose of the use of project method.

Demonstration method of instruction according to Nwachukwu (2011) is one of the very effective methods applied by the teachers in achieving objective learning in real-life situations. Demonstration involves the capability to include different formats and instruction material to make the learning process engaging (Wenjiang, 2012). According to Ericson (2018) from the time vocational and technical education courses were introduced into the school subject, the demonstration method has stood out as the most definite and valuable means for instruction. It continues to be so whenever it is desirable to have students learn exact and acceptable procedures in mechanical operation. Its success is based upon imitation as a factor in learning and it is well known fact that imitation is a natural instinct, which figured greatly in all types of education. Supporting this notion, Nwachukwu noted that a demonstration usually involve a process in which the learner follows a manner of planned and organized steps. These steps help the method become a realistic and impressive one and also prove a true learning experience where actual object, good models or apparatus are used. Neeraja (2011) says demonstration leads to the activation of the learners' senses, creating more opportunities for learning.

Other methods used in technical and vocational education are discussion and field trip. The discussion method is based upon extensive contributions of ideas and expressions from the members of the class (Ericson, 2018). This method gives students an opportunity to derive information from themselves and teacher. According to Ericson, the assumption is that everyone in the class has something to contribute. The students and the teacher are actively involved in

talking, unlike in lecture method where the teacher does all the talking. Ukoha and Eneogwe (2016) added that two key points should be noted when using discussion method; discussion required a clearly stated objective to serve as a focus and guiding post. Neglecting this criterion may hamper the realization of the set objectives, as discussion may degenerate to mere informal debate on superficial issues and the emergence of a star speaker who eventually will dominate the discussion. Secondly, to ensure effective participation of the members, prior knowledge of the discussion topic is essential. Donche (2013) says discussion is a democratic way of handling a class, where each student is given equal opportunity to interact and put forth their views. The discussion topic could be derived from several controlled experiences of the learner, such as viewing an educational filing, listening to a lecture, reading an assigned book or going on a field trip. The impacts of the field trip method of teaching on the technical college students can not be overemphasized.

2.2.4 Concept of Field Trip Method of Teaching

Field trips have been used by teachers for over a century and have become one of the most memorable activities students experience during their school years (Pace & Tesi, 2014). Field trip was introduced in 1827 by George Shilibeer for a Quaker school at Abney Park in Stoke Newington, London, United Kingdom. A field trip is a visit to a place outside the school regular classroom which is designed to achieve certain objectives, which cannot be achieved in the classroom teaching. For example if the lesson is on making a casted pot and there is no experience on it, it will be very difficult to achieve the objectives. According to Instructional Strategies Online (2013) fieldtrip is a study trip taken outside the classroom to obtain direct experience from the natural setting and to improve student's interest in learning through the collection of data and materials and observation of phenomena that is impossible to bring within

the classroom. It is a way of teaching carried out by taking the students to a particular location to learn new things like reviewing a casting, fabricating shop and a welding shop. It can also be a journey carried out by a group of students to observe daily activities in order to acquire educational skills and experience.

According to Akubuilo (2010) field trip is a method of teaching that involves taking the students on an excursion outside the classroom for the purpose of making relevant observation necessary for understanding of the topic under study. Field trip enable student to obtain scientific, technological and vocational information. Field trip provides an opportunity to involve student, parents and the teachers in the instructional programme. Student can select the place to be visited, developing questions to ask, and writing report after the trip. Since parents must give their permission, a letter sent home with permission from explaining purpose of the trip is a good way to arouse their curiosity and encourage them to ask the student or teacher about the trip. The parent guides their child in order to make sure that they do not come to any harm.

There are several factors that enhance or affect the level of learning that students experience while attending a field trip site such as (a) the role of the teacher, (b) pre-during and post-trip activities, and (c) students' prior knowledge and site orientation (Levine & Grenier, 2012). One of the most crucial factor is the role of the teacher including, among other tasks, choosing a proper field trip site and handling all the necessary issues (e.g transportation, expenses, meals, as so on. (Marcus 2012).

Merits and Demerits of Field Trip

Obeka (2010) outline some of the merits and demerits of field trip, they are as follows:-

Demerits

a) Expensive to undertake.
b) Time waste excursion may be too far and accident may occur.
c) It interrupt time programme.

Merits

a. It's aroused the interest of student and increases their motivation to learn.
b. It helps to the students to be more imaginative and observe life more often. Hence, they acquire skills for critical observation.
c. It helps the students to have firsthand experience of real things. Thus, it is considered as providing learning experience which cannot be acquired in the classroom practically.
d. It relates things studied in the classroom with actual activities outside the classroom which is the society and the community.
e. It affords valuable opportunities to develop interest in some subject area and career opportunities.
f. It creates opportunities for the students to interact with experts, and this enables effective learning and teaching.

Also field trip offers a lot of meaningful and educative opportunities to students. These opportunities according to Wilson (2011) are as follows:

1. Field trips provide real learning experience to students as it provides them with opportunities to put what they learn through other method of teaching into practice.
2. Field trips activities give students the opportunities to see the world cultures, diversities and realities.

3. Field trips enhance student's memory as the students usually remember what they learn during the trip for many years.
4. Technical field trips give the student opportunities to gather real life and practical experience.
5. There is an improvement in the interpersonal relationship as the students go out and study in groups, they learn to work and support each other.

In light of the above, this study investigated the effects of field trip on the academic achievement of metal work student in technical colleges.

2.2.5 Academic Achievement of Students in Metalwork Technology

Metalwork technology is practical oriented trade in the curriculum of technical colleges in Nigeria. Observation reveals that there has been high failure rate in this trade due to inappropriate and ineffective teaching strategies always employed by teacher during teaching. In other words academic achievement of students is low beyond expectation. Academic achievement refers to a student's success in meeting short or long term goals in education, in the big picture, academic achievement means completing high school or earning a college degree. In a given semester, high academic achievement may mean student is on the honor roll.

Academic achievement may also refer to a person's strong performance in a given academic arena. Achievement is a process that involves the adolescents self development of a stable sense, and it thus results from graduation of being dependent on parents to depending on self (Ajerole, 2016). It involves integrating several aspects of self personality or role to a coherent whole-such as having sexual identity, vocational, direction or ideological world view (Eyibe, 2014). Academic achievement according to Maslow theory (1967) refers to some methods of expressing a student's scholastic standing. This can be regarded as course or subject

grade, an average for a group of courses/subject in a program of study (in this case, metal work technology is being referred to). There are two dimensions to academic achievement: good academic achievement that leads to, success and poor academic achievement that resulted to failure. Each of the achievement has been experienced by students in one form or another. A number of motivational processes (intrinsic and extrinsic) are involved in achievement (Tella, 2017). Intrinsic motivation is based on internal factors such as self-determination, curiosity, challenge, and effort. On the other hand, extrinsic motivation involves external incentives such reward and punishments. The humanistic and cognitive approaches stress the importance of intrinsic motivation in achievement.

However, teacher's attitude to teaching and learning in metalwork go a long way in academic achievement, interest and retention of metalwork students. Okafor (2010) described interest as the attraction which forces or compels a child to a particular stimulus. According to Osuafor (2011), the affective disposition of the student has direct consequence on his academic achievement. . For students to develop positive attitudes towards in automobile trade there is needed to get them interested in such automobile system. Students' interest is very paramount in the course of learning.

2.2.6 Interest of Students in Metalwork Technology

Interest according the Hornby (2011) is an activity or subject that a person enjoys and spends free time doing or studying. Worker (2016) defined interest as a social construction developing within the dynamic relationship between the individual and the situation. Also, Okoro (2012) refers interest to mean what an individual likes or dislikes and that they are usually associated with activities. The researcher refers interest to be the positive state of mind or the

standard that respond to the learning processes. He further stated that interest of a child has direct bearing to the quality of work and educational attainment.

Ezeike (2016) said interest is the motive which serves as important influence in producing both activities and attitudes that are favorable to learning. Corroborating Ezeike, Okeke (2017) maintained that a highly motivated student is likely to more than a poorly motivated student as the former would utilize every opportunity to learn. Nwachukwu (2011) stated that the learner's interest is very important in the study of any subject because the interest of a learner is in many ways the reflections of his deeds as well as strong indicators of timeless and relevance.

Therefore, it is pertinent to say that the interest of a student in a particular trade or career has a long way in the academic achievement of such student. Udoekoriko (2016) indicated that there is a very close relationship between a student's interest and his academic achievement. They further explained that individual interest have personal significance and are usually associated with high levels of knowledge and value, positive emotions and increased reference value. From the above, interest is seen to play a meditational role in academic achievement, specially between instructional and academic outcomes. Interest can also vary when it comes to the gender of the students.

2.2.7 Gender Issues in Metalwork Technology Education

Gender refers to a wide range of biological, social, physical and mental characteristics differentiating the female and male population (Sade & Adesina, 2015). Gender is a socially determined construct describing the characteristics, behavior and roles deemed appropriate and expected of men and woman (boys and girls by a given society). These characteristics and behavior are reinforced through a socialization process that begins early in life and continues

throughout the life cycle (Roller, 2012). Gender is a sense of awareness of being male or female. It is a behavioral pattern and attitude perceived as masculine or feminine with a culture (Colman, 2013). Gender guides how females and males think about themselves, how they interact with others and the position they occupy in the society. Female and male do differ biologically but male participation in technical colleges in Nigeria is been historically favored (Iloegbunam, 2010). Lauren (2012) noted that within the learning environment, gender plays a critical role, since teacher respond differently to boys and girls within the same classroom. If the teaching methods can be made suitable and interesting to both gender it can help to overcome gender issues in metalwork education.

2.3 Review of Related Empirical Studies

Amosa, Ogunlade and Atobatele (2013) investigation is related to this present study in the sense that the study is concerned with the effect of field trip on students' academic performance in learning practical skills in Basic Technology in Ilorin, Nigeria. A pre-test, post-test and control group quasi experimental design was adopted for the study. Two sampled upper basic Schools were selected from Ilorin East Local Government Area of Kwara State using purposive sampling technique. The two sampled upper basic Schools comprised 50 students who were randomly assigned to treatment (25 students) and control (25 students) group. Analysis of Co-variance (ANCOVA) was used to analyze the data collected. The findings revealed that at significant level, the value produced $F(2, 22) = 3.44 > 0.109$. Therefore, hypothesis two was rejected. Also, at 0.05 significant level, the value produced $F(2,9) = 4.26 > 0.433$. Therefore, hypothesis two was rejected. Based on the findings, it was recommended among others that teachers should take students on field trip so as to promote and encourage active engagement in learning, self-motivation, discovery learning and learning by experience.

Silas, Sababa and Jacob (2016) investigation is related to this present research in the sense that it studied the Effects of field trip Strategy on Senior Secondary Students' Academic Achievement in Geography in Numan Educational Zone, Adamawa State, Nigeria. Two research question and two hypotheses was formulated and tested in the study. The study adopted a quasi-experimental research design. A sample size of 138 Senior Secondary Two (SS2) students offering geography from two public senior secondary school in Numan Educational Zone was used for the study. There are two group; experimental and control group which are taught for six weeks. The research instruments used to obtain data were the Teachers' Qualification Assessment Checklist (TQAC), Field trip Facilities Inventory (FFI), and the Geography Achievement Test (GAT). The reliability index of the instrument (GAT) was determined using Guttmann Split-half Static. These yield a reliability coefficient of 0.70. The research questions were answered using frequency counts and percentage and the hypotheses was tested using Kolmogorov Smirnov two-sample test. The findings show that male students in the experimental groups performed better in geography than their female counterparts. The researcher recommended that Government should provide the secondary school facilities for conducting field trip and that geography teachers should adopt field trip teaching strategy in teaching their student's.

Ahmad (2017) investigation is related to the present study as it investigate the Effects of Field trip on Retention and Academic Achievement in Ecology among Secondary School Students in Zaria, Nigeria. An experimental design which utilized Pre-test, Post-test Control Group was adopted. The population of the study consisted of 2934 SS1 Students from nineteen (19) public schools in Zaria Educational Zone of Kaduna State. Four schools was randomly selected and two schools was used as experimental group while the other two school was used as

the control group. The experimental group was taught using field trip strategy while the control group was taught using lecture method. A stratified schools and a total of 200 students were selected as sample size from both urban and rural areas. The instruments used for this study were Ecology Achievement Test (EAT) with reliability value 0.83 and Ecology Retention Test (ERT) with reliability value 0.85 aimed at determining the achievement and retention of the students. The finding of the study showed that field trip strategy favored the experimental group. The researcher recommended that government should make field trip compulsory in teaching and learning at secondary level.

Ezechi (2018) investigation have a relationship with this present study in the sense that the two studies look at the Influence of field trip in Teaching and Learning of Biology in Enugu East LGA of Enugu state, Nigeria. Three research questions guided the study, survey design was used for the study. The sample size was 100 senior secondary school II (SS2) students. The instrument used for data collection was questionnaire made up of 15 items. The instrument was validated by three experts. The reliability coefficient of 0.79 was obtained for the instruments using cronbach alpha. The findings revealed that teachers use field trip once a year and that some teachers do not use it at all in their teaching and learning of biology. The findings also revealed among others that field trip is an effective method of teaching, since its helps student acquire useful knowledge while having fun and relaxation at the same time. The researcher recommended that extensive field trip should be organized by schools so as to expose the students to events outside the classroom.

2.4 Summary of Literature Reviewed

The intention of this literature review is to bring forth pertinent research and literature on the fundamental areas needed to build a foundation for this study. Some of these areas included the theoretical framework of Piaget's Developmental theory of learning and Dewey Experiential learning theory. Technical colleges in Nigeria and Metalwork technology, the method of teaching metalwork technology in Technical colleges, the concept of field trip, academic achievement, interest and gender issues. From the opinions above, all the experts have the same idea that field trip is a visit or a journey to an outdoor setting for the purpose of impacting the student with knowledge and to increase their academic achievement. Field trips have proven to have great potential for student cognitive and non-cognitive learning. Field trip will give the students opportunities to become actively engaged in observing, collecting, classifying, studying relationship and manipulate objects, which enhance meaningful learning.

Many scholars and researchers have used field trip teaching strategy in various subject areas such as Biology, Basic Technology, Geography and Ecology studies. However, in the field of metalwork technology particularly not much work has been carried out on the effects of field trip on student's academic achievement and interest in metalwork in technical college. This informed the researcher choice of this research. In view of the implication above, it showed that the findings of the researcher above did not compare the academic achievement and interest of student studying metalwork in technical colleges using field trip teaching method.

Therefore, this study investigated the effects of field trip on student's academic achievement and interest taught metalwork in technical college. As a result, this study made recommendations on the teaching method that should be used in teaching metalwork in technical college.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Design of the Study

A mixed design was used for the study. Sambo (2012) stated that survey research design is one, which involves the assessment of public opinions through collection of detailed descriptions of existing phenomena with the intent of using the data to justify current conditions and practices or to make better plans for improved phenomena. Quasi-experimental design can be used when it is not possible for the researcher to randomly sample the subject and assign them to treatment groups without disrupting the academic programmes of the school involved in the study (Borg, 2017). According to Ali (2016), quasi experimental research design can only be employed where the researcher cannot randomly sample and assign the subjects to groups. Ali further explained that in quasi experimental research design, pretest is administered at the beginning of the proposed study so that pretest data can be used to find out whether the subjects in the different groups are homogenous (equivalent) or not. This design was considered suitable because intact classes were assigned to experimental and control groups to determine the effects of fieldtrip on the academic achievement and interest of metalwork students' in technical colleges in Niger state. Most importantly, the pre-test and post-test non-equivalent control group was used. The design took the following form:

Experimental Group: O_1 x $O_{2,}$ O_3 Control Group: O – $O_{2,}$ O_3

Where O_1= represents pre-test; O_2= represents a post-test; O_3= represents an interest inventory test; x = stands for the treatment; - = treatment with conventional method.

3.2 Area of the Study

The study was carried out in Niger State. The state is located at latitude 3.20^{o} East and Longitude 11.30^{o} North. The state has twenty five local Government Areas. There are seven NBTE accredited technical colleges in Niger State which are located among the seven educational zones under the following Local Government Areas, namely; Chanchanga, Bida, Kontagora, Suleja, Rafi, Shiroro and New Bussa respectively. The study was specifically carried out and limited to two technical colleges due to the insecurity of the state. The two technical colleges namely; Government Technical College (GTC) Minna and Government Technical College (GTC) Eyagi Bida.

3.3 Population of the Study

The population of the study comprises of hundred (100) Year Two General metalwork students in two technical colleges in Niger State. 67 students were male while 33 were females. The population of the general metalwork technology students according to the class registers are: GTC Minna 50 students (35males and 15 females), GTC Eyagi Bida 50 Students (31 males and 19 females). Refer to Appendix E.

3.4 Sampling and Sampling Techniques

The two accredited technical colleges were purposively sampled for the study. The students in metal trade were used. No sampling was carried out.

3.5 Instrument for Data Collection

The following instrument was developed for the data collection in this study; Field trip lesson plans, Conventional lesson plans, General Metalwork Achievement Test (GMWAT), Two Structured Questionnaire. The GMWAT was used to test the students' achievement in metalwork and it was design by the researcher. The GMWAT is a multiple choice question (MCQ) consisting of 20 items with four option (A-D). The instrument covers the content area of the TC II selected topics of the study. The questions are based on curricular specification and objectives specified by the teacher.

The questionnaire was titled "General Metalwork Interest Inventory (GMWII). The GMWIT was used for testing students' interest in metalwork. It was divided into two sections (A and B). Section A will be used to collect information on personal data of respondents while Section B consists of 15 items. The items of the questionnaires are based on the scale Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (DS).

3.6 Validation of the Instrument

The following instrument used in the research; Field trip lesson plans, Conventional lesson plans, GMWAT and a structured questionnaire was subjected to face and content validity by three experts. This is to determine the suitability of the test and check if the language in conducting the instrument is suitable for TC 2 students, remove any items that were not necessary and add any items that are necessary. The final draft of the instrument was developed by the suggestion and comments of the validators.

3.7 Reliability of the Instrument

To establish the reliability of the GMWAT instrument, a pilot test was carried out at GTC Kaura Namoda, Zamfara State, which was not part of the study. The result obtained from the pilot test was used to determine the reliability coefficient for GMWAT. The internal consistency reliability coefficient was determined using the Kuder Richardson (K-20). The calculated K-20 estimate was 0.86. For ALSII Instrument, Cronbach Alpha statistics was used to determine the internal consistency. This was also considered because it is applied for tests that are not dichotomously scored. The reliability of the instrument was found to be 0.84.

3.8 Experimental Procedure

This study used two instructional approaches. The experimental group (taught with the use of field trip) and the control group (taught with the use of conventional). GTC Minna was assigned to treatment conditions using field trip method while GTC Eyagi-Bida serves as control group using conventional method. The use of Conventional lesson plan and Field trip are identical in terms of content to be taught, instructional objective and method of evaluation. The only difference between them is the instructional strategy activities integrated into the teaching of the experimental group. Before the treatment, pre-test (GMWAT) was administered to the two groups in order to ascertain the homogeneity of the two groups.

Three weeks intensive teaching was given to the two groups after the pre-test. After the completion of the lessons, the post-test was administered to the two groups. The subject teacher and their assistant administered the test so as to avoid and reduce experimental bias. The pre-test results provided the baseline data on the dependant variable (Achievement) before treating while the post-test result provided the post-treatment data for the study. The researcher brief the teacher on the instructional procedure involved in order to ensure homogeneity of instruction

across groups. The briefing was based on the use of lesson plans, purpose of study, topic to be taught, the general conduct of the study and not informing the student in the treatment groups that they are being involved in any research process.

3.9 Method of Data Collection

The scores generated from the pre-test and post-test administered to the general metalwork students of the Technical Colleges using General Metalwork Achievement Test (GMWAT) and General metalwork Interest Inventory (GMWI) were used as the data collected for the researcher work.

3.10 Method of Data Analysis

The data was analyzed in line with the research questions and hypotheses. Mean ($\overline{X}$) and Standard Deviation (SD) were used in answering the first two research questions and Analysis of Covariance (ANCOVA) statistics was used to test the null hypotheses at .05 level of probability. The last research question was also analysis using mean ($\overline{X}$), while the t-test was used to test the hypothesis of the two group of respondents at 0.05 level of significance.

3.11 Decision Rule:

The decision on testing the hypotheses was based on comparing the P-value on the output of the statistical tool used with a significance level of 0.05. The null hypothesis was rejected when P-value is less than .05. Otherwise, the null hypothesis is accepted. Any Group with higher mean value irrespective of the closeness in the mean value of the other group would be taken to have performed better in the achievement test. The responses from the questionnaire were analyzed using mean, standard deviation and t-test. A mean of 3.50-4.00, 2.50-3.49, 1.50-2.49

and 1.00-1.49 was used at decision point for every questionnaire item and was tag as Strongly Agree (SA), Agree (A), Disagree (D) and Disagree (DS) respectively.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

The data collected was analyzed according to the research questions and hypotheses formulated.

4.1 Research Question One

What is the effect of fieldtrip on metalwork students' academic achievement?

Table 1: Mean and Standard Deviation of Pre-test and Post-test Scores of Experimental (Field trip) and Control (Conventional) Group in the Achievement Test

		Pre-test		Post-test		
Group	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean Gain**
Experimental	50	12.30	1.62	17.42	1.49	5.12
Control	50	11.94	2.18	12.66	1.85	0.72

The data in Table 1 show that the experimental group had a mean of 12.30 and a standard deviation of 1.62 in the pre-test and mean score of 17.42 and standard deviation of 1.49 in the post-test making the pre-test - post-test mean gain in the experimental group to be 5.12. The control group had a mean score of 11.94 and a standard deviation of 2.18 in the pre-test and a mean of 12.66 and standard deviation of 1.85 in the post-test, resulting in a mean gain of 0.72. With this result, this implies that General Metalwork students taught using field trip method of teaching performed better than those taught using conventional method of teaching.

4.2 Research Question Two

What is the influence of gender on technical college metalwork students' academic achievement when taught using field trip method of teaching?

Table 2: Mean and Standard Deviation of Pre-test and Post-test Scores of Male and Female in the Experimental in the Achievement Test

Group	N	Pretest		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Male	35	12.66	1.64	17.29	1.62	4.63
Female	15	12.30	1.33	17.73	1.10	5.43

The data in Table 2 show that the male in the experimental group had a mean of 12.66 and a standard deviation of 1.64 in the pre-test and mean score of 17.29 and standard deviation of 1.62 in the post-test making the pre-test - post-test mean gain in the experimental group to be 4.63. The female had a mean score of 12.30 and a standard deviation of 1.33 in the pre-test and a mean of 17.73 and standard deviation of 1.10 in the post-test, resulting in a mean gain of 5.43. With this result, this implies that the Field Trip Method of Teaching is effective and is both applicable on both genders of students.

4.3 Research Question Three

What is the effect of field trip on metalwork technical college students' interest on the use of lathe machine?

Table 3: Mean respondents on the effect of field trip on metalwork technical college students' interest on the use of lathe machine between Technical College Students.

$N_1 = 50$; N_2: = 50

S/N	Items	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_T$	Remark
1.	Lathe machine is simple to understand.	3.47	3.15	3.31	A
2.	Learning the type of lathe machine is interesting.	3.99	2.63	3.60	SA
3.	The teacher makes the learning interesting through the method of teaching.	3.33	2.51	3.21	A
4.	I prefer real-life experience to classroom teaching.	3.90	3.00	3.74	SA
5.	I pay more attention when I went out on field trip to see the lathe machine.	3.71	3.00	3.65	SA
6.	I understand the functions of each parts of the lathe machine.	3.71	2.80	3.55	SA
7.	I understand metalwork when am engage in the learning activities.	3.82	2.91	3.66	SA
8.	I explore information on lathe machine.	3.61	2.77	3.48	A

9.	I like doing assignment on lathe machine.	3.55	2.80	3.47	A
10.	I encourage my friends to develop interest in metalwork technology.	3.71	2.63	3.46	A
11.	Facing operation is simple to understand.	3.71	2.54	2.84	A
12.	Turning operation is simple to understand.	3.16	2.46	2.52	A
13.	I understand the important of lathe machine accessories.	3.81	2.77	3.00	A
14.	I like to work in an accident free workshop.	3.87	2.71	3.00	A
15.	I always wish metalwork technology lesson should continue even after its time is up.	3.60	2.71	2.87	A

Key: $\mathbf{X_1}$ = Mean of Respondents of Government Technical College, Minna; $\mathbf{X_2}$ = Mean of Respondents of Government Technical College, Eyagi-Bida; $\mathbf{X_T}$ = Mean of Respondents of Government Technical College, Minna and Eyagi-Bida, obtained by$\left(\frac{X_1+X_2}{2}\right)$; $\mathbf{N_1}$ = Number of Respondents of Government Technical College, Minna; $\mathbf{N_2}$ = Number of Respondents of Government Technical College, Minna.

The result presented in Table 3 above revealed that the respondents (Government Technical College Students of Minna and Eyagi-Bida) agreed with all the items. This implies that the entire itemized description has significant effect of field trip on metalwork technical college students' interest on the use of lathe machine.

4.4 Testing of Hypotheses 1

$H0_1$: There is no significant difference between the mean academic achievement score of metalwork students' taught using fieldtrip method of teaching and those taught with conventional method.

Table 4: Analysis of Covariance (ANOCOVA) for Test of Significance between the Mean Academic Achievement Students taught with Field trip and those with Conventional method.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	620.455[a]	3	206.818	228.991	.000
Intercept	.048	1	.048	.054	.817
Pretest	173.123	1	173.123	191.684	.000
Posttest	131.378	1	131.378	145.463	.000
Group	.188	1	.188	.208	.649
Error	86.705	96	.903		
Total	1480.000	100			
Corrected Total	707.160	99			

a. R Squared = .877 (Adjusted R Squared = .874)

Table 4 shows that field trip method of teaching is effective and significant to students' achievement in GMWAT. This is shown by the calculated F-value of .208 with a significance of P at .649 which is greater than 0.05. Hence, the null hypothesis of no significant difference is accepted. This implies that there is a no significant difference between the achievement scores of students taught metalwork with field trip and those taught using conventional method of teaching.

4.5 Testing of Hypotheses 2

$H0_2$: There is no significant difference between the academic achievement of male and female students taught using field trip method of teaching as measure by pre-test and post-test mean score.

Table 4.5: Analysis of Covariance (ANOCOVA) for Test of Significance between the Mean Academic Achievement of Male and Female Students taught with Field trip method of teaching.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	135.853[a]	3	45.284	2155.029	.000
Intercept	.003	1	.003	.166	.686
Pretest	90.008	1	90.008	4283.371	.000
Posttest	82.820	1	82.820	3941.302	.000

Gender	.009	1	.009	.430	.515
Error	.967	46	.021		
Total	1417.000	50			
Corrected Total	136.820	49			

Table 5 revealed that the observed difference in the main achievement scores of students' based on gender was not significant. This is shown by the calculated F-value of .430 which is significant at .515 because it is greater than .05, to this effect, the null hypothesis was accepted. This gives the impetus to conclude that, there was no significant difference in students' achievement in metalwork based on gender.

4.6 Testing Hypothesis 3

H0$_3$: There is no significant difference between the standard deviation and t-test of the responses of Government Technical College Students of Minna and Eyagi-Bida students on the effect of field trip on metalwork technical college students' interest on the use of lathe machine.

Table 6: Standard Deviation and t-test analysis of the responses of Government Technical College Students of Minna and Eyagi-Bida students on the effect of field trip on metalwork technical college students' interest on the use of lathe machine

N_1 = 50; N_2: = 50;

S/N	Items	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_T$	SD_1	SD_2	t-cal.	Remark
1.	Lathe machine is simple to understand.	3.47	3.15	3.31	1.89	1.78	3.19	NS
2.	Learning the type of lathe machine is interesting.	3.99	2.63	3.60	1.88	1.60	7.53	NS
3.	The teacher makes the learning interesting through the method of teaching.	3.33	2.51	3.21	1.89	1.56	3.09	NS
4.	I prefer real-life experience to classroom teaching.	3.90	3.00	3.74	1.91	1.91	2.92	NS
5.	I pay more attention when I went out on field trip to see the lathe machine.	3.71	3.00	3.65	1.89	1.94	2.76	NS
6.	I understand the functions of each parts of the lathe machine.	3.71	2.80	3.55	1.87	1.87	3.07	NS
7.	I understand metalwork when am engage in the learning activities.	3.82	2.91	3.66	1.88	1.74	3.35	NS
8.	I explore information on lathe machine.	3.61	2.77	3.48	1.83	1.65	3.08	NS
9.	I like doing assignment on lathe machine	3.55	2.80	3.47	1.78	1.80	2.16	NS
10.	I encourage my friends to develop interest in metalwork technology.	3.71	2.63	3.46	1.98	1.65	4.84	NS

11.	Facing operation is simple to understand.	3.71	2.54	2.84	1.92	1.66	5.56	NS
12.	Turning operation is simple to understand.	3.16	2.46	2.52	1.90	1.51	2.12	NS
13.	I understand the important of lathe machine accessories.	3.81	2.77	3.00	1.80	1.73	4.37	NS
14.	I like to work in an accident free workshop.	3.87	2.71	3.00	1.87	1.46	6.82	NS
15.	I always wish metalwork technology lesson should continue even after its time is up.	3.60	2.71	2.87	1.93	1.71	3.25	NS

Key: N_1 = Number of Respondents of Government Technical College, Minna; **N_2 =** Number of Respondents of Government Technical College, Minna. **S** = Significant; **NS** = Not Significant **SD_1**=Standard Deviations of Respondents of Government Technical College, Minna; **SD_2**= Standard Deviations of Respondents of Government Technical College, Eyagi-Bida. **Degree of Freedom (df)** = $N_1 + N_2 - 2 = 25$, $T_{critical} = \pm 1.69$ **T-Cal. =** t-test value of the Respondents of Government Technical College, Minna and Eyagi-Bida.

The analysis in Table 2 shows that there is no significant difference in the mean response of Respondents of Government Technical College, Minna on the entire 15 items items. Therefore, we fail to reject the null hypothesis and conclude that field trip on metalwork technical college has significance effect on students' interest on the use of lathe machine.

4.7 Findings of the Study

1. Field trip method of teaching was very effective in improving students achievement in General Metalwork Technology but conventional method of teaching was less effective compare to field trip method of teaching.
2. Gender has no effect on achievement of students in General Metalwork when they are taught using field trip method of teaching.
3. Field trip method of teaching was effective in arousing the interest of students in learning General Metalwork while conventional method does not.
4. There is no significant difference in the achievement mean score of students taught using field trip method of teaching and those taught using conventional method of teaching.
5. There is no significant difference in the achievement score of male and female students taught with field trip method of teaching.

6. There is no significant difference in the interest of metalwork student taught using field trip method of teaching.

4.8 Discussion of Findings

The findings revealed that the group of students taught with field trip method and those taught with conventional method of teaching were compared based on the mean scores of the pre-test and post-test. The pre-test result was used to provide fact which could be reasonably assumed that both the group of student taught with field trip method of teaching and those taught with conventional method had equivalent entry knowledge before treatment. The results justify the comparison of the achievements of the students taught with field trip and those taught with conventional method on an equal level which shows significance difference between the groups. The post-test result indicated that the group of student taught field trip and those taught with conventional method have been subjected to the use of Standardized and Improvised Instructional Materials. This result agreed with the findings of Okay, (2010) who said that availability of learning resources are very important, especially in technical institutions. Also this agrees with Nworgu (2013) who asserted that achievement can only be recorded in student when there is effective transmission of instruction through using the appropriate Instructional Materials. The post-test results revealed that the difference in the mean achievement scores of the student taught General Metalwork using both field trip method of teaching and conventional method of teaching is significant.

This findings on the mean achievement of the group of student taught using field trip and those taught with conventional method is inline with findings of David (2016) and Michie (2017) which stated that knowledge gains were found to be significant with the experimental group

using field trip method of teaching more than their counter part that were strictly taught in the class using conventional method in metalwork trade. The implication here is that the present teacher of General Metalwork Technology should see the need to plan and carry out student on field trip for effective understanding of their subject matter.

The findings on achievement with respect to gender showed that there was no significant difference in the achievement of the male and female students when taught using field trip. This implies that male students did not perform better than female students in General Metalwork Technology when taught by field trip method of teaching. The non-significant difference in the academic performance of male and female students in General Metalwork Technology has supported the findings of (Nwoji, 2013). Field trip method of teaching is devoid of sex bias and does not discriminate on gender basis. It is, therefore adequate for both the male and female students.

The analyses and results of this study showed that the experimental group had higher mean scores than the control group in the post-test. These findings indicate that field trip method of teaching has a positive effect on students' academic achievement and interest in general metalwork. This implies that the key components found in field trip method of teaching when used are more effective than conventional method in enhancing student academic achievement and interest.

Therefore, field trip is effective in teaching metalwork student than conventional method. The result of the findings of the interest inventory questionnaire also revealed that there is no significant difference in the mean response of Respondents of student in Government Technical College, Minna on the entire 15 items. Therefore, the null hypotheses were accepted and

conclude that field trip on metalwork technical college has significance effect on students' interest on the use of lathe machine. Teacher should also ensure that learning experiences is been effectively incorporate into the student by allowing them participate actively in the lesson through field trip method of teaching.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMEDATIONS

5.1 Summary of the Study

The study was carried out to compare the effect of using field trip method of teaching on students' academic achievement and interest in metalwork in technical colleges in Niger State, the study was structured into five chapters.

Chapter one dealt with the background to the study where statement of the problem for this study was presented. Objectives, research questions and hypotheses were raised. Significance and scope of the study were presented. Chapter two covers the review of related studies, where numerous materials were assessed. The independent variable; Technical education in Nigeria, The method of teaching metalwork technology in Technical colleges, the concept of field trip, academic achievement, interest and gender issues and Theoretical literature. Several empirical studies were also reviewed.

Chapter three presents the methodology used to carry out this study. Descriptive survey and a quasi-experimental design, the research study was carried out in two technical colleges in Niger State, the population targeted for the study is two (2) technical colleges in Niger State will be used for this research work. Selected due to the insecurity issues in the other local government the technical college is located. A total of number of hundred (100) students was randomly selected. Lesson plans, Achievement test and Interest Inventory Questionnaire were the instrument used for data collection.

Chapter four presents result and discussion. Data collected were statistically analysed and result presented in a tabular form. The research questions answered were analysed using Mean and standard deviation, while t-test statistics was used to test the null hypotheses that was formulated for study. Summary of the findings and discussion were presented. The three null hypotheses stated, were retained.

Finally, chapter five presents summary of the study, where each chapter discussed was summarized in detail. Implications of the study was also presented based on the findings, Conclusion is also presented based on the findings. And recommendations are also made for teacher, parents and policy makers who may be interested on Metalwork technology and Suggestion for further study was also made.

5.2 Implications of the study

The finding of this study have proved beyond reasonable doubt that field trip method of teaching have a significant effect on the academic achievement and interest of students offering general metalwork subjects in technical colleges. The findings of this study have implications for the Government, school administrators and the teachers of Metalwork technology. The government and the administrators of technical colleges offering Metalwork technology will organize workshop and seminars based on effects of field trip strategy on student academic achievement and also encourage the using of field trip strategy.

5.3 Conclusion

Metalwork is a trade found in technical colleges to equip students with knowledge, skills and attitudes for self-reliance. However, the academic performance of metalwork trade graduates over the year has not been encouraging. These problems can be dealt with if the teaching method

of the trade can be change to field trip method of teaching. This study was step up to investigate the effect of field trip on the academic achievement and interest of metalwork students in technical college. The investigation therefore reveals that teaching metalwork to student using field trip is better than employing conventional method of teaching.

5.4 Recommendations

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

1. Metalwork teachers in technical colleges should adopt the use of field trip strategy to teach metalwork trades to students.
2. More funds should be provided for teacher in order to carry the student on field trip.
3. Workshop and seminar should be organized for Metalwork teachers on the effective use of field trip strategy.
4. The use of conventional method of teaching should be discouraged among teacher who taught metalwork students.
5. Students should always be allow to participate actively and interact freely with the teachers and peers when they are on field trip as this will improve their academic achievement in metalwork.
6. Metalwork subject is not difficult to teach and learn if the method of teaching is suitable and effective.

5.5 Suggestion for Further Study

The following related areas have been suggested for further research:

1. Effects of Field trip on the academic achievement and retention of students in other trades in technical colleges.
2. Effects of Field trip on Student Cognitive Ability in Metalwork trade in technical college
3. Competency improvement needs of teachers in the use of Field Trip for teaching Metalwork.
4. Effect of Field trip on student's academic achievement, attitude and retention on Metalwork technology Student in Technical colleges.

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APPENDIX A

GMWAT Control Group Lesson Plans

LESSON PLAN 1

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Machine

INSTRUCTIONAL METHODS: - Conventional Method

INSTRUCTIONAL AIDS: - Chart showing lathe machine and its parts.

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

i) Define lathe machine.
ii) Mention three (3) type of lathe machine.
iii) State all the basic parts of the lathe machine.
iv) Explain the functions of five (5) parts of the lathe machine.

ENTRY BEHAVIOUR: - The students have been taught on the type of machine used in metalworking workshop.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe machine is a general purpose machine, which is used for machining different round objects. It makes the work easier and simplify.	State the objective of the lesson	Note down the objectives of the lesson
Step 1	Types of Lathe Machine Centre Lathe, CNC Lathe, Ornamental Lathe machine, Patternmaker's Lathe machine,Single Screw Lathe machine	Define lathe machine	Note down the definition of lathe machine
Step 2	Parts of Lathe machine Headstock, Tailstock, Carriage, Cross slide, Compound slide, Bed, Feed mechanism, Gears. Bed: - is a base of lathe machine which consist of two or four feet. I t	Mention the types of lathe machine	Note the types of the lathe machine

	is made up of cast iron. Tailstock: - is the one of the most important part of the machine. It is on the right side of the machine. Headstock: - is a major part of lathe machine which is on the left side of the lathe machine. All gears and motor which is used to start and stop to the machine are available in this part.		
Step 3	Carriage: - is also a main part of lathe machine which is in between the headstock and the tailstock. It slides on the bed ways which are on the bed of the lathe machine.	State the basic part of the lathe machine	Note the basic part of the lathe machine
Step 4	Cross slide: - is a part that moves on the cross-slide keyways on the carriage. It moves vertical to the job. Compound slide: - is a part that offers a way to turn tapers and cut angles on a lathe without rotating the headstock.	Explain the functions of each part of the lathe machine	Note the functions of each part of the lathe machine
Evaluation	Tool post: - is used for clamping the tool on the lathe machine. Gears:- is located on the headstock, it provides power for the lathe machine. It can slow down and speed up the machine.	Evaluates the lesson by asking the student to:- Define lathe machine. Mention three (3) type of lathe machine. State all the basic parts of lathe machine. Explain the functions of five (5) parts of lathe machine.	The student answers all the question ask by the teacher.
Assignment & Conclusion		Summarizes the lesson and gives the student assignment to define lathe machine.	The students copy the assignment.

LESSON PLAN 2

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Machine

INSTRUCTIONAL METHODS: - Conventional Method

INSTRUCTIONAL AID: - Chart showing lathe accessories & attachment

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

i) Define lathe accessories.
ii) Mention and explain three (3) types of lathe accessories.
iii) Define lathe attachment
iv) Mention and explain three (3) types of lathe attachment.

ENTRY BEHAVIOUR: - The students have been taught on the lathe machine and the basic parts of lathe machine.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe accessories are the tools and equipment used in routine lathe machining operations.	State the objective of the lesson	Note down the objectives of the lesson
Step 1	Examples of lathe accessories are as follows:- Chuck, Faceplate, Lathe Centers, Mandrels • Chuck: - is a device that exerts pressure on the work piece to hold it secure to the headstock spindle or tailstock spindle. • Faceplate: - is a flat, round plate that is thread to the headstock spindle of the lathe. • Lathe Center: - are the most common devices for supporting work pieces in a lathe. The work piece is supported	The teacher define lathe accessories	The student note down the definition of lathe accessories

	between two centers, one in the headstock spindle and one in the tailstock spindle. • Mandrels: - is a device used to support work piece that cannot be held between centre because its axis has been bored or drilled.		
Step 2	Lathe attachments are special fixtures that may be mounted on the lathe to expand the use and the functions of the lathe which include taper cutting, milling and grinding. Examples of lathe attachment includes:- • Taper turning with attachment for lathe • Milling attachment for lathe • Grinding attachment for lathe.	The teacher mention and explain two (2) example of lathe accessories	The student note the types of the lathe machine
Step 3		The teacher define lathe attachment	The student note the definition of lathe attachment
Step 4		The teacher mentions the example of lathe attachment.	The student note the examples of lathe attachment
Evaluation		Evaluates the student by asking them to :- Define lathe accessories. Mention and explain three (3) types of lathe accessories. Define lathe accessories. Mention and explain three (3) types of lathe attachment.	The students answer all the questions ask by the teacher.

Assignment & Conclusion		Conclude the class by giving the student assignment to draw three (3) lathe accessories.	Copy down the assignment

LESSON PLAN 3

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Operation

INSTRUCTIONAL METHODS: - Conventional Method

INSTRUCTIONAL AIDS: - Chart showing lathe operations steps.

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

i) Mention three (3) categories of lathe operations.
ii) Mention five (5) types of lathe operation
iii) Explain five (5) types of lathe operations.

ENTRY BEHAVIOUR: - The students have been taught on the lathe machine accessories and attachment.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe operation is classified into three main categories and they are as follows: - Lathe machine operations done either by holding the work piece between centre or by a chuck. Turning , Forming, Knurling , Facing operation, Chamfering operation,	State the objective of the lesson	Note down the objectives of the lesson

	Thread cutting operation Lathe machine operations which are performed by holding the work by a chuck or a face plate.		
Step 1	Drilling, Reaming, Boring, Undercutting , Parting-off	List the categories of lathe operations	Note the lathe operations
Step 2	Lathe operations performed using special attachments. Grinding and Milling.	Mention five (5) lathe operations	Note the type of lathe operations
Step 3	a. Turning operation: - is the operation of removing excess material from the workpiece to produce a cylindrical surfaces to the desired length. b. Facing Operation: - is an operation of reducing the length of the workpiece by feeding the perpendicular to the lathe axis. c. Chamfering operation: - is an operation of getting a beveled surface at the edges of a cylindrical workpiece. It is done in the case of bolt ends and shaft ends.	The teacher explains the type of lathe operations.	The student note the explanation of lathe operations.
Step 4	d. Knurling Operation: - is an operation of obtaining a diamond shape on the workpiece for the gripping purpose. It provides better gripping surface when operated by hands.	Explain how to carry out facing and turning operation on the lathe machine.	The student note the explanation of how to carry out turning and facing on the lathe machine.
Evaluation	e. Forming operation: - is the process of turning a convex or any irregular shape. It is usually done by forming tool.	Evaluates the lesson by asking the student to: - Mention three (3) categories of lathe operations. Mention five (5)	The student answer all the question in the class

		lathe operations.	
Assignment & Conclusion		Summarize the lesson and give the student assignment to explain turning and facing operation.	The student copy down the assignment.

GMWAT Experimental Group Lesson Plan

LESSON PLAN 1

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Machine

INSTRUCTIONAL METHODS: - Field trip Method

INSTRUCTIONAL AIDS: - Lathe machine and its parts (Machine Tool Process Workshop)

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

v) Define lathe machine.
vi) Mention three (3) type of lathe machine.
vii) State all the basic parts of the lathe machine.
viii) Explain the functions of five (5) parts of the lathe machine.

ENTRY BEHAVIOUR: - The students have been taught on the type of machine used in metalworking workshop.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe machine is a general purpose machine, which is used for machining different round objects. It makes the work easier and	The teacher state the objective of the lesson, inform the student about the rules and regulation	Note down the objectives of the lesson

	simplify.	of the workshop.	
Presentation	Types of Lathe Machine Centre Lathe, CNC Lathe Ornamental Lathe, Patternmaker's Lathe , Single Screw Lathe	The teacher define lathe machine and show the machine to the student and also show them the type of lathe machine in the workshop.	The student will see the lathe machine, study it and could write note on lathe machine. The student will be able to see each type of
	Parts of Lathe machine Headstock, Tailstock, Carriage, Cross slide, Compound slide, Bed, Feed mechanism, Gears. Bed: - is a base of lathe machine which consist of two or four feet. I t is made up of cast iron. Tailstock: - is the one of the most important part of the machine. It is on the right side of the machine. Headstock: - is a major part of lathe machine which is on the left side of the lathe machine. All gears and motor which is used to start and stop to the machine are available in this part.	The teacher explains the functions of each part of the lathe machine to the student with the help of the machine operator. The teacher gives brief summary of the lesson. The teacher gave the student assignment to write short note on lathe machine and its parts.	lathe machine in the machine workshop. The student will be able to see how each parts of the lathe machine carry out his functions. The student copy down the assignment.
	Carriage: - is also a main part of lathe machine which is in between the headstock and the tailstock. It slides on the bed ways which are on the bed of the lathe machine. Cross slide: - is a part that moves on the cross-slide keyways on the carriage. It moves vertical to the job. Compound slide: - is a part that offers a way to turn tapers and cut angles on a lathe without rotating		

	the headstock. Tool post: - is used for clamping the tool on the lathe machine. Gears: - is located on the headstock, it provides power for the lathe machine. It can slow down and speed up the machine.		
Evaluation		Evaluates the lesson by asking the student to:- Define lathe machine. Mention three (3) type of lathe machine. State all the basic parts of the lathe machine. Explain the functions of five (5) parts of lathe machine.	The student answers all the questions ask by the teacher.

LESSON PLAN 2

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Accessories and Attachment

INSTRUCTIONAL METHODS: - Field Trip Method

INSTRUCTIONAL AIDS: - Lathe accessories & Lathe attachment (Machine Tool Process Workshop)

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

v) Define lathe accessories.
vi) Mention and explain three (3) types of lathe accessories.
vii) Define lathe attachment

viii) Mention and explain three (3) types of lathe attachment.

ENTRY BEHAVIOUR: - The students have been taught on the lathe machine and the basic parts of lathe machine.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe accessories are the tools and equipment used in routine lathe machining operations.	The teacher states the objectives of the lesson, inform the students about the rules and regulations of the machine shop and the safety measures to be taken. The teacher shows the student the lathe accessories and attachment with the help of the machine operator. The teachers explain the important of the lathe accessories and lathe attachment.	The students write down the objectives of the lesson and note all the rules, regulations and safety measures in the workshop. The students were able to touch and draw the lathe accessories and lathe attachment, ask questions
Presentation	Examples of lathe accessories are as follows:- Chuck, Faceplate, Lathe Centers, Mandrels Chuck: - is a device that exerts pressure on the work piece to hold it secure to the headstock spindle or tailstock spindle. Faceplate: - is a flat, round plate that is thread to the headstock spindle of the lathe. Lathe Center: - are the most common devices for supporting work pieces in a lathe. The work piece is supported between two centers, one in the headstock spindle and one in the tailstock spindle. Mandrels: - is a device used to support work piece that cannot be held between centre because its axis has been bored or drilled.	The teacher gives the student assignment to draw two lathe accessories and attachment.	and also answer questions during the trip.

	Lathe attachments are special fixtures that may be mounted on the lathe to expand the use and the functions of the lathe which include taper cutting, milling and grinding.		
Evaluation	Examples of lathe attachment includes: - Taper turning , milling and Grinding attachment for lathe	Evaluates the lesson the asking the student to: - Define lathe accessories. Mention and explain three (3) types of lathe accessories. Define lathe attachment. Mention and explain three (3) types of lathe attachment.	

LESSON PLAN 3

CLASS: - TC II

DURATION: - 50 Minutes

TOPIC: - Machine Tool and Processes

SUB-TOPIC:- Lathe Operations

INSTRUCTIONAL METHODS: - Field trip Method

INSTRUCTIONAL AIDS: - Lathe machine (Machine Tool Process Workshop)

BEHAVIOURAL OBJECTIVES: - At the end of the lesson the student should be able to: -

i) Mention three (3) categories of lathe operations.
ii) Mention five (5) types of lathe operation
iii) Explain five (5) types of lathe operations.

ENTRY BEHAVIOUR: - The students have been taught on the lathe machine accessories and attachment.

Steps	**Content**	**Teacher Activity**	**Student Activity**
Introduction	Lathe operation is classified into three main categories and they are as follows: - Lathe machine operations done either by holding the work piece between centre or by a chuck. a. Turning operation. b. Forming. c. Knurling operation. d. Facing operation. e. Chamfering operation. f. Thread cutting operation Lathe machine operations which are performed by holding the work by a chuck or a face plate	The teacher states the objectives of the lesson and also reminds the students of the safety measures and rules to be followed in the machine shop workshop. The teacher guide the students as they are exposed to different lathe operation and how they are been carried out.	The students note down the objectives of the lesson, they are able to observed how different lathe operation is been carried out especially the turning and facing operation. The students are able to ask questions and also answer question.
Presentation	Drilling, Reaming , Boring, Undercutting, Parting-off. Lathe operations performed using special attachments:- Grinding and Milling. Lathe operations Turning operation: - is the operation of removing excess material from the workpiece to produce a cylindrical surfaces to the desired length. Facing Operation: - is an operation of reducing the length of the workpiece by feeding the perpendicular to the lathe axis. Chamfering operation: - is an operation of getting a beveled surface at the edges of a cylindrical workpiece. It is done in the case of bolt ends and shaft ends.		
	Knurling Operation: - is an operation of obtaining a diamond shape on the workpiece for the		

	gripping purpose.		
	Forming operation: - is the process of turning a convex or any irregular shape. It is usually done by forming tool.		
Evaluation		Evaluates the lesson by asking the student to: - Mention three (3) categories of lathe operation. Mention five (5) type of lathe operation. Explain five (5) type of lathe operation	

APPENDIX B

GENERAL METALWORK ACHIEVEMENT TEST (GMWAT)

1. ……..is a general purpose machine used for machining different round objects?
A. Milling machine B. Late machine C. Sawing machine D. Lathe machine **Answer: D**
2. …….is a type of lathe machine.
A. School B. Big C. Center D. Aluminum **Answer: C**
3. …….is a part of lathe machine
A. Bed B. Chair C. Work D. Piece **Answer: A**
4. ……..is a base of lathe machine
A. Headstock B. Bed C. Stock D. Spindle **Answer: A**
5. …….is used for clamping the tool on the lathe machine
A. Tool post B. Bed C. Spindle D. Workpiece **Answer: A**
6. Carriage is in between the headstock and the ……..
A. Tool post B. Workpiece C. Bed D. Tailstock **Answer: D**
7. ……provides power for the lathe machine
A. Engine B. Gears C. Bed D. Tailstock **Answer: B**
8. …….are tools and equipment used in lathe machining operations.
A. Accessories B. Accesses C. Equipment D. Tool **Answer: A**
9. …….. is a type of lathe accessories
A. Chalk B. Chuck C. Bed D. Tailstock **Answer: B**
10. Taper attachment is used for turning and boring ……
A. Tapers B. Work C. Tool D. Equipment **Answer: A**
11. Lathe machine operations are classified into ……..categories.
A. 3 B. 2 C. 1 D. 4 **Answer: A**
12. …… is a lathe machine operation.
A. Turning B. Machining C. Sawing D. Bending **Answer: A**
13. ……..is the operation of removing excess material from the workpiece.
A. Tooding B. Turning C. Grinding D. Milling **Answer: B**
14. ……. reduces the length of the workpiece by feeding perpendicular to the lathe axis.
A. Facing B. Turning C. Drilling D. Grinding **Answer: A**
15. ……is a type of lathe machine
A. CNC B. CON C. Turning D. Milling **Answer: A**
16. Forming operation is done using …….tool
A. Turning B. Grinding C. Forming D. Milling **Answer: C**
17. …….is used to obtain a diamond shape on the workpiece for gripping purpose.
A. Knurling B. Turning C. Drilling D. Grinding **Answer: A**
18. The tailstock is located at the ……side of the lathe machine
A. Down B. Left C. Upside D. Right **Answer: D**
19. The headstock is located at the ……..side of the lathe machine.
A. Right B. Left C. Upside D. Down **Answer: A**
20. The gear of the lathe machine is located on the ……..of the lathe machine.
A. Tailstock B. Bed C. Headstock D. Bed **Answer: C**

APPENDIX C

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

P.M.B 65, MINNA NIGER STATE, NIGERIA

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

QUESTIONNAIRE ON METALWORK TECHNOLOGY INTEREST INVENTORY

SECTION A

Government Technical College Minna { } Government Technical College Eyagi-Bida { }

Male { } Female { }

SECTION B

Read this questionnaire items carefully and tick the response appropriate to each item. The response categories are:

SA = Strongly Agreed = 4 points, A Agreed = 3 points,

D = Disagreed = 2 points, SD = Strongly Disagreed = 1 points

S/N	ITEM	SA 4	A 3	D 2	SD 1
1.	Lathe machine is simple to understand.				
2.	Learning the type of lathe machine is interesting.				
3.	The teacher makes the learning interesting through the method of teaching.				
4.	I prefer real-life experience to classroom teaching.				
5.	I pay more attention when I went out on field trip to see the lathe machine.				
6.	I understand the functions of each parts of the lathe machine.				
7.	I understand metalwork when am engage in the learning activities.				
8.	I explore information on lathe machine.				
9.	I like doing assignment on lathe machine.				
10.	I encourage my friends to develop interest in metalwork technology.				
11.	Facing operation is simple to understand.				
12.	Turning operation is simple to understand.				
13.	I understand the important of lathe machine accessories.				
14.	I like to work in an accident free workshop.				
15.	I always wish metalwork technology lesson should continue even after its time is up.				

APPENDIX D

Field Trip Method of Teaching					Conventional Method of Teaching			
Pupils	**Gender**	**Pre-Test**	**Post-Test**		**Pupils**	**Gender**	**Pre-Test**	**Post-Test**
1	M	9	14		1	M	16	18
2	M	13	16		2	M	17	16
3	F	12	16		3	F	18	13
4	M	11	16		4	M	14	14
5	F	12	18		5	F	13	15
6	M	15	17		6	M	11	14
7	M	14	16		7	M	13	14
8	M	14	16		8	F	10	10
9	M	13	17		9	M	8	10
10	F	12	17		10	M	9	14
11	F	11	18		11	M	11	12
12	M	10	16		12	M	12	13
13	F	15	17		13	F	11	11
14	M	12	17		14	F	10	12
15	F	11	18		15	M	9	10
16	F	10	18		16	M	8	10
17	M	14	18		17	M	12	12
18	M	12	17		18	M	13	15
19	M	11	16		19	F	14	14
20	F	10	16		20	M	11	10
21	M	10	14		21	M	15	16

22	M	11	17		22	F	10	12
23	F	12	18		23	F	11	12
24	F	13	19		24	M	12	12
25	M	11	15		25	F	13	12
26	M	11	16		26	F	14	14
27	M	12	15		27	M	11	11
28	M	17	19		28	M	11	12
29	F	11	19		29	M	11	13
30	M	13	18		30	M	14	14
31	F	12	19		31	M	12	10
32	M	13	19		32	F	10	12
33	F	10	16		33	M	10	10
34	F	12	19		34	M	11	10
35	M	13	18		35	M	13	14
36	M	14	18		36	F	11	11
37	M	12	19		37	F	10	11
38	M	14	20		38	M	9	12
39	M	13	18		39	M	11	12
40	M	10	16		40	M	13	13
41	M	14	19		41	M	14	14
42	F	13	18		42	F	14	15
43	M	12	17		43	F	12	13
44	M	13	19		44	M	10	12
45	M	11	17		45	F	13	14

46	M	15	18		46	M	14	14
47	M	13	20		47	F	15	15
48	M	14	20		48	F	10	11
49	M	12	19		49	M	11	12
50	M	13	18		50	M	12	13
Total		615	871		Total		597	633
Mean		12.30	17.42		Mean		11.94	12.66
S.D		1.62	1.49		S.D		2.18	1.85

STATISTICAL DATA

Field Trip Method of Teaching								
Pupils	**Gender**	**Pre-Test**	**Post-Test**		**Pupils**	**Gender**	**Pre-Test**	**Post-Test**
1	M	9	14		1	F	12	16
2	M	13	16		2	F	12	18
3	M	11	16		3	F	12	17
4	M	15	17		4	F	11	18
5	M	14	16		5	F	15	17
6	M	14	16		6	F	11	18
7	M	13	17		7	F	10	18
8	M	10	16		8	F	10	16
9	M	12	17		9	F	12	18
10	M	14	18		10	F	13	19
11	M	12	17		11	F	11	19
12	M	11	16		12	F	12	19
13	M	10	14		13	F	10	16
14	M	11	17		14	F	12	19
15	M	11	15		15	F	13	18
16	M	11	16			**Total**	176	266
17	M	12	15			**Mean**	12.30	17.73
18	M	17	19			**S.D**	1.33	1.10
19	M	13	18					
20	M	13	19					
21	M	13	18					

22	M	14	18	
23	M	12	19	
24	M	14	20	
25	M	13	18	
26	M	10	16	
27	M	14	19	
28	M	12	17	
29	M	13	19	
30	M	11	17	
31	M	15	18	
32	M	13	20	
33	M	14	20	
34	M	12	19	
35	M	13	18	
	Total	439	605	
	Mean	12.66	17.29	
	S.D	1.64	1.62	

APPENDIX E

Population of the Study

Schools	**Male Students**	**Female Students**	**Total**
GTC Minna	35	15	50
GTC Bida	31	19	50
Total	66	34	100