THE ROLE OF ENGINE MODEL IN THE TEACHING AND LEARNING OF AUTOMOBILE TECHNOLOGY IN COLLEGES OF EDUCATION IN NORTH-EASTERN STATES OF NIGERIA

BY

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DECLARATION

I, Abdullahi Mamuda, a postgraduate student in the department of technology education with registration number M. Tech/TE/06/0032 do declare that the work described in this thesis represents my original work and has not been previously submitted in part or full to any university or similar institution for any degree or certificate.

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APPROVAL PAGE

This thesis entitled “The Role of Engine Model in the Teaching and Learning of Automobile Technology in Colleges of Education in North-Eastern States of Nigeria” by Abdullahi Mamuda M. Tech/TE/06/0032 meets the regulation governing the award of degree of M. Tech (Industrial Technology Education),of the Modibbo Adama University of Technology, Yola and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to my father, late Mamuda Mado, my mother Asama'u and my brother Haruna Mamuda who initiated my academic work. I am very grateful for their patience and understanding.

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ABSTRACT

This research study was carried out to examine the role of engine model in the teaching and learning of automobile technology in colleges of education in North-Eastern States of Nigeria. Four research questions and four hypotheses formulated guided the study. The study used opinion survey design. The areas covered were the five colleges of education that offer automobile technology in the Northeastern States of Nigeria. The population for the study was 195 which comprises of 30 lecturers and 165 NCE III students offering Automobile Technology for 2009/2010 Academic Session. The type of instrument used was a structured questionnaire. The instrument were validated by three experts and their comments, advices and suggestions were used in the development of the final instrument. The instrument yielded reliability coefficient of 0.85. Data collected was through direct administration of questionnaire to the respondents and the analysis of data was conducted using mean and standard deviation. While Z-test was used in testing the hypotheses. The findings of the study showed that students taught with the use of engine model would be exposed to skills of automobile engine and when teachers use engine models in teaching, would expose students to a wide range of learning experiences example crankshaft, piston and tappet. The findings also revealed that engine models are not available for teaching in colleges of education. The study recommended among other things that College managements would have to provide adequate engine models for teaching Automobile Technology, and demonstration methods in teaching using engine models could be used by teachers.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Technical and Vocational Education involve training in the process of applying both science and technology to solve practical problems. Ihekwoaba (2003) defined technical vocational education as the type of education given to individual to enable him to be gain employed. Because as a nation, Nigeria needs skilled human resources such as artisans, craftsmen, technicians, technologists, engineers and scientists in order to meet the needs of the people adequately and sustainably.

Ahmed (1999) stated that the development needs of the society are numerous and need to get as many skilled hands mobilized to help meet those needs. Therefore, technical vocational education according to National Policy on Education(FRN,2004), is that aspect of education that gives, its recipients' opportunity to acquire practical skills. In general terms technical vocational education also involves the acquisition of skills and competence that can help an individual to function productively in industries and commercial occupation. In the same vein, (FRN, 2004) also stated that, Technical Vocational Education provides technical knowledge and vocational skills necessary for technological, agricultural, commercial and economic development in a more practical way.

To attain the objectives of National Policy on Education, teachers must command confidence in the subject matter as well as methodology of imparting the knowledge. In agreement with this the (FRN, 2004) stated that all teachers in Nigerian educational institutions from primary schools to universities would be professionally trained. Therefore, when automobile technology teachers are well trained, they would be able to teach effectively using Automobile engine model.

It is generally known that education unlocks the door to modernization, but it is often realized and appreciated that it is the teacher who determines what actually happens in the classroom. It is he/she who translates policies into practices and theories with action (Ukeje, 1989). Skill acquisition in any teaching and learning activities involves student participation in observing and manipulating real objects and materials. Students are usually expected to exhibit the acquired skills using relevant tools and equipment available to them.

Oladimeji (1995) stated that acquisition of practical skills relating to occupation in various sectors of economic and social life will improve the standard of living of people. Dale in Usman (2008) stated that engine model is the core of experience in the teaching and learning of Automobile Technology. Teacher uses engine models as an instructional material in practical lessons with students. They are the materials through which the learning process are encouraged and carried out.

Ezeji (1995) emphasized that industrial arts education requires laboratory/workshop setting with adequate training materials as a unique learning situation in which the learner may experiment, test, construct, assemble, disassemble, repair, design, fabricate, create, imagine and study. In the same vein, Anuakoha (1992) explained that the development of useful skills can be reinforced by the appropriate selection and use of learning materials and resources. Constant supply of adequate number of engine models for teaching and learning of Automobile technology would improve the standard of workshop/laboratory in Colleges of Education. Kalat (2007) stated that instructional materials in workshops are working instruments in different fields of skill acquisition which are designed to suit specific work or operation.

Ochiagha (1995) defined skill acquisition as the need to help people learn and acquire appropriate knowledge, skills and attitude that enable them to develop their intellectual, social, physical, emotional and economic capabilities. To possess a skill is to demonstrate the habit of acting, thinking or behaving in a specific activity. As a process,

skills acquisition becomes natural to the individual through practice; skills can then be described as knowledge that is put into practical use. In another development, Olaitain, Nwachukwu, Onyemachi, Igbo and Okong (1999) stated that proper usage of instructional materials serves various purposes in the teaching and learning process. These include:

i. Demonstrating specific skills
ii. Carrying out manually operated functions.
iii. Providing supportive functions to the functioning of used equipment and tools.
iv. Performing mechanically operated activities.
v. Hiding students skill development activities
vi. Promoting students memory development and recall.
vii. Aiding the construction and production purposes
viii. Evaluating success of skill acquisition. (Pp 270-271)

Instructional material in Automobile Technology as stated by Odunsanya (2003) have all practical and skill development resources that would enhance the process of teaching, learning and evaluation of technical skills in automobile technology, tools equipment and other resource materials that could be used in directing and controlling operation as well as reinforcing the teaching and learning in this area.

Fagbeza (1998) observed that the present situation in the workshops gives the impression that in spite of the invaluable contributions engine model makes towards effective classroom and workshop learning, some teachers are not in the habit of using them in their teaching process where it is found in the workshop.

Obi and Michael (2005) emphasized the need for competency of teachers in Automobile Technology that he/she must be committed, fully prepared and have a very important self assessment. Olaitan (1981) stated that the main problem of the teachers is how to impart knowledge, skills and other capabilities to students. Olaitan further stated that it is important for teachers to be equipped with knowledge and skill on how to make

learning effective. The importance of the application of engine models in the teaching and learning of automobile technology cannot be over-stressed. The teachers should therefore exploit the benefit inherent in the use of models in teaching automobile concept so as to exploit the benefit of insightful learning to learners

Teaching according to Gibson (2004) is the planned interaction between the learner and the learning activities through which learning occurs. On this basis teaching can be defined as all activities engaged in by the teaching staffs with the aid of facilitating change in the learners' behaviour. Teachers employ various methods like demonstration and experimentation, as well as the use of materials, workshop tools and equipments to effect the desired learning out come and behavioural changes in learners.

Uyanga (2005) stated that teaching is the act of using media to sensitize the learner towards assimilation and retention of facts concepts, theories and principles taught. The ultimate criterion of effective teaching is the teachers' impact upon the learners learning. In other words teaching is effective to the extent to which the presentation, discussion and ordering of the elements of the task to be learned, approach the optimum for the individual learner.

On the other hand, effective learning is considered as a modification of a person's behaviour so that his or her behaviour is changed on a more permanent basis. Learning is a mental practical activity of the learner, which is more than mere reception or storing of information. According to Engestrom (1994), the learner literally constructs a picture of the subject matter and forms explanation model of its element and sequence. He/she select and interprets' information. The learners always end up correlating and merging newly acquired subject matter into the on-going activity and earlier construction.

According to Dolan (1980). Automobile means a vehicle which can move by itself. In the same vein Narang (2001) defined automobile as a vehicle producing power within itself for its propulsion which is known as a self-propelled vehicle e.g. motor cycle, car, tractor, locomotive, motor boat, ship, aeroplane. A self propelled vehicle used

for transportation of goods and passengers on the ground is called an automobile. It is first taught through theoretical means, where the learners are being imparted with knowledge. Okorie (2000) opined that the issue of work-force development should be so developed to an extent that the achievement of the desired technological change needed by a nation would not be hindered because of lack of individual with requisite practical skills for the change.

Olaitan,et al. (2000) stated that the vision of vocational technical education is not a mere theoretical frame work of ideas, proposal and knowledge. It is based on concrete principles and models that are applicable to real work situations. For example some students in technical colleges who study automobile technology hardly maintain, service and repair vehicle. This study has therefore examined the role of engine models in teaching and learning of automobile technology.

1.2 Statement of the Problem

The provision of live or dead engine has become very costly for most colleges of education that offer automobile technology as a course. Students in this area hardly have a meaningful practical exercise with relevant material before graduation. It was expected that the minimum any department of automobile technology should have at least one life engine and one dead engine for students practical exercises to enhance skill acquisition process. This study was focused on finding a cost effective ways of performing practical exercise that would at least expose students to the basics of automobile engine parts hence the role of engine model in the teaching and learning automobile technology.

According to Obunnake (2000), teaching and learning is said to be effective when two or more senses are impinged upon. Therefore, this study aimed at examining the role of engine models in terms of, the extent to which teaching using engine model give students the basic knowledge of practical techniques of Automobile engine, the extent to which engine model would be used by teachers for teaching to expose the students to a wide range of Automobile engine learning experience, the adequacy of engine model for

teaching and learning of Automobile and the appropriate methods of teaching to be adopted using engine model in Automobile Technology. Teaching using live or dead engine has become a problem because they are not available in most of the workshop in colleges of education.

1.3 Purpose of the Study

The general purpose of the study was to examine the role of engine model in the teaching and learning of Automobile Technology in Colleges of Education in the North-Eastern States of Nigeria. The specific purposes of the study were to determine:

1. The extent to which engine model expose students to the basic knowledge of Automobile Engine.
2. The extent to which engine model is used by teachers to teach students Automobile Technology.
3. The availability of engine model in colleges of education for teaching and learning of Automobile Technology.
4. The appropriate methods of teaching to be adopted using engine model in Automobile Technology.

1.4 Research Questions

The following research questions guided the study.

1. To what extent does engine model exposes students to practical techniques of Automobile engine?
2. To what extent do teachers use engine model to teach students Automobile technology.
3. How adequate are engine models used for teaching and learning of Automobile Technology in College of Education?
4. What appropriate methods of teaching to be adopted using engine model in Automobile Technology?

1.5 Hypotheses

The following hypotheses were tested at 0.05 level of significance.

Ho_1: There is no significant difference between the mean response of lecturers and NCE III students on the extent to which Engine models expose students to the basic knowledge of practical techniques of Automobile engine

Ho_2: There is no significant difference between the mean response of lecturers and NCE III Students on the extent to which teachers use engine model for teaching to teach the students to wide range of Automobile learning experience

Ho_3: There is no significant difference between the mean responses of lecturers and NCE III students on the adequacy of engine model in the teaching and learning of Automobile technology.

Ho_4: There is no significant difference between the mean response of lecturers and NCE III Students on the appropriate methods of teaching to be adopted for teaching Automobile Technology using engine model.

1.6 Significance of the Study

The study would be significant in the following ways. The findings of this study would be of benefit to Colleges of Education Technical and other institutions of learning that offer automobile technology by giving suggestions to National Commission for Colleges of Education for curriculum development and implementation for teaching and learning. This study would also be of importance to students of automobile technology who are receiving training through provision of automobile engine models for practical exercise to enable them acquire knowledge and skills for self-reliance. The study would also be a reference source to researchers in relevant study area of automobile on additional knowledge of automobile skill acquisition.

1.7 Scope of the Study

The scope of the study was all the colleges of education in the North-Eastern States of Nigeria that are dully accredited to offer Automobile Technology Education including their lecturers and students. Two Federal owned Colleges of Education located at Gombe and Potiskum in Gombe and Yobe states, three state owned Colleges of Education located at Bama in Borno state, Hong in Adamawa state and Azare in Bauchi state respectively.

1.8 Operational Definition of Terms

Engine Model: - A copy of an object, which is a representation of the original object.

Automobile: automatic mechanical system that produces motion either in form of rotation or transmission by the combustion of air and fuel.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this chapter works related to the present study were reviewed. The review was done under the following sub-headings:

2.1 Theoretical Framework of the Study

Thorndike in Garba (1996) stated the law of exercise that the more practice students have the more they learns, therefore, this study is based on Thorndike's law of exercise, the more practices students has the more they learned. The more practical students carry out in automobile technology the more they become proficient. This enables students to be exposed to skills acquisition in automobile technology.

Mills (1979) stated that practical lesson is designed to encourage students to identify a task with the guidance of the teacher to carry out such a task to its logical conclusion. The number and nature of such task may vary. Individual work done by an individual student while group work is carried out by students in group.

That is the group members contribute ideas to ensure that the tasks and learning experiences are oriented towards achieving educational goals and to help students relate the knowledge acquired to real life situation. Garba (1996) identified three successive stages through which a child can develop skills, these include: mental stage here a child deals with mental images of objects. Symbolic stage at this stage the child is strictly manipulating symbols. Enactive stage- at this stage a child manipulate learning materials directly Garba also stated that any object can be taught effectively at any stage of development.

According to Enemali (2006), instruction has no practical value unless the learner can practice the integration of theory and practice that sets technical training apart from general education. Without applying the theory, one has not learnt to practice and one cannot truly acquire skills. The more complex a skill, the more difficult it is to learn (Tolman, 2008). Thorndike in Garba (1996) Stated that the law of exercise that the more practice students have the more they learns. This study is based on Thorndike law of exercise. This law is particularly evident in psychomotor learning. According to Dewey in Abubakar (1995), students learn by doing and they do what they learn. Uchechi (1995) stated that "every job has both theory and practical side".

2.2 The Concepts of Engine Model in the Teaching and Learning of Automobile Technology

Engine Model has widely been used in workshop as instructional materials for teaching technical vocational education. Thus, the purpose of engine model is to develop and enhance the level of student's practical skills on the basis of normal range covered by theory lesson (Garba, 1993), Garba further stated engine model served as continuity in the instructional process in order to meet the objectives which have been set out. Engine model stimulates learning and has become important motivation factor in technical and vocational causes where master of skills play an important role.

Similarly, Idi (1998) stated that practical lessons is a means of developing student's general professional skills and attitudes similar to professional in practice. It provides students with real problem to which they are expected to provide a suitable solution, approved practical activity which would show their freedom of intellectual and physical movement. In another development, Olaitan (1999) stated that the modern automobile engine models for learning skills are those that have been tested and found useful for developing functional skills. Olaitan further explained the skills acquisition models thus:

a. Complementary Model: Are teaching situations whereby more than one type of teaching methods or techniques is used in sequence to make instruction functional. It involves providing instruction to learners by way of technical information which is followed by practical work or the real job. It is also applicable by the technical teacher for imparting the desired skills to learners. Cluster Model; is an approach to learning that brings the subject into a clearly understandable form and closely related skill components of a trade.

b. Ask them Model: Is a model usually employed for motivating a group of individuals interested in the self-development of skills in useful occupations. The model views each participant as an individual who needs to; develop skills in occupation, wants those skills because they hope to progress through the skills. In most cases individuals develop interest in technology as a result of inductive interest of unconditional consequences. These individuals although are not strongly rooted in technological experience, get residual interest to participate in technical task.

c. Tell them Model: Is designed for individuals seeking for employment in an occupation or self employment. The model assumes that the individual wants skills in that occupation needs it and hopes to progress by it. This therefore requires further training as the individual has made-up his mind to undertake career in the

occupation which enables him meet the requirements of a job either on employment or be self employed. In this model individuals are told what to do as the model contains programme objectives related to specific occupation which also contain rational, instructions and learning activities for which the individuals are to be trained for.

d. Task-Instructional Model: Is designed to equip learners with skills in vocational training institutions using problem solving approach.

Methods and models of learning skills is considered relevant to practical skills acquisition which helps in determining both the progress and sustainability of every programme undertake (Olaitan, 1999).

2.3 The Concept of Psychomotor Domain

Bloom in Okpala, Onocha and Oyedeji. (1993) classified psychomotor domain into seven levels. Namely:

a. Perception
b. Set (readiness)
c. Guidance response (include imitation)
d. Mechanism (concerned with the skillful performance arts)
e. Complex overt response (concern with the skillful performance of motor acts)
f. Adaptation (concerned with skills that developed the individual can modify movement patterns to fit special requirements)
g. Original (refers to the creation of a new movement patterns to fit a particular situation of a specific problem)

Adam (1971) observed that the taxonomic approach does not give clear guidelines for instructions. An open loop theory which claims that some skills have no feedback or means for error correction until the task has ended. The movements used in such skills are so fast that corrective feed-back cannot be assured. Such skills usually had no out put

because they are mostly external situation, while the close loop theory, indicates that some skills have feedback error direction and error correction are used as the basis for activity. For instance skills in using engine analyzer to test the sparking plugs.

Later several approaches have been identified about psychomotor skills. Shemich cited in Tolman (2008) stated that some authors organized their taxonomy on learning sequence on the degree of complexity of movements others arrange their own hierarchically, on a continued of' psychomotor behavior, or even restricted it to the training of military personnel. The term psychomotor is placed between two terminals of skills continuum. More so the relationship between skill and performance is that if skill is the sequence of responses required for a specific task, then performance is the configuration of task. Performance is here defined as an organized sequence of activities.

Ezewu in Osuagwu (1990) suggested a new domain of educational objective labeled the psycho-productive domain which combines elements of the cognitive, the affective and psychomotor domain. This domain based on the assumption that any production would require first of all, an understanding of the terminologies related to the job; the attitudes, motivation, perseverance and the ability to use the sense. Thus, learning, irrespective of the subject will involve the cognitive, the affective and the psychomotor domain.

Padeford in Idi (1998) stated that the psychomotor skill is complex form of a hierarchical scheme and those that were proposed by earlier authors were less than universal in nature for these reasons a model based on the neuron-muscular skill tasks of Tolman (2008) was conceptualized. This contains major factors with sub-factors which identified the specific elements of the domain as follows: -

(1) Muscular action consisting of gross, fine gross and fine skills tasks embodying manipulative, with device, manipulative without device, locomotors and non locomotors.

(2) Attributes including speed, dexterity, strength, coordination and so on.

Also Singer in Adamu (2005) classified psychomotor behaviors as follows: -

(1) Motor skills which include:

(i) Fine motor skills

(ii) Manual skills

(iii) Gross motor skills

(2) Physical task which includes:

(i) Perceptual motor behavior

(ii) Language skills

(1) Motor skills: - refers to muscular movement or motion of the body required for the successful execution of a desired specific act. (Same as perceptual motor skills).

(i) Fine motor skills: - These encompass the neuromuscular co-ordinations involved in precision oriented tasks that is, eye-hand co-ordination. For example, grinding a piece of metal.

(ii) Manual skills: - These are usually eye-arm-hand manipulative task that are fairly repetitive. Examples are turn a piece of metal on a lather machine and drill a hole on a drilling machine.

(iii) Gross motor skills: - These involved the large muscles and the movements of the majority of the body. Example is sports.

(2) Physical task: - It involves physical fitness test. It also required minimal co-ordination of the body parts and cognitive activity, strength endurance, speed and flexibility.

(i) Percept: - motor behavior: It deals with high degree of perceptual component. It is also particularly used to connote the special training programmes for young star.

(ii) Language skills: These are heavily perception of words. The formation of mouth movement, expressions and production of words. Moreover, Craft in Adamu (2005) observed that the psychomotor skill is base on complexity. These are made up of: (1)

simple movement (2) compound tasks (3) complex movement (4) skills families. Psychomotor skills result from organized muscle activity in response to stimuli from the environment. Examples are throwing a ball, driving, operating a machine and typing. Psychomotor skills are controlled by the sensory and motor cortex of the brain, as well as the nerve fibers. These connect two hemispheres of the brain (Tolman, 2008). Psychomotor skills is an act of doing something well. The quantitative measure of skills is refers to as psychomotor domain.

2.4 The Importance of Engine Model in Teaching and Learning of Automobile Technology

One benefit of learning using engine model is that students learn to work together to solve problems. Collaboration involves sharing ideas to find resolutions to questions. In order to succeed in the real world, students need to know how to work with people from different backgrounds (Krajcik, et al (1999). Also Prince (2004) summarized the literature on active learning that leads to better student attitudes and improvements in students thinking and conception.

According to Onasanya, and Adegbija (2007). They stated that a model has the following advantages:

(a) They have a distinct appeal to young learners and attract them better.

(b) Their 3 dimensional characters give a better conception of reality than pictures.

(c) Representation of real objects.

(d) They can be produced by learners with local materials

An emphasis on the effect of engine model, on students academic, an investigation by Okam and Nedosa (2000) shows that up to 70% of students fail to perceive the importance of engine model during teaching-learning process. The reason was traced to teachers' low and negative perception of the role of engine model for effective teaching of the curriculum content of automobile technology.

Imogie (1988) viewed engine model as the vehicle through which instruction are disseminated to the learners for the purpose of appealing to their senses of touching and seeing so that desired behavioral responses are achieved. Okorie (1982) explained models as the teaching materials and devices used in learning situations to supplement the written word in the transmission of knowledge and skills.

Adewoyin (1991) explained that engine model provide students with experiences of engine component and their functions. For example, crank shaft, camshaft, piston, valves and flywheel. In another development, Agun (1976) stated that models can be used to arrest and sustain attention, they can be used to present facts and information to teach concepts and principles to guide thinking and induce transfer of learning. Misconception and misinterpretation can be arrested if facts are presented through models.

Abdullahi and Ojular (1998) looked at skill as that phenomenon which is regarded in a particular workplace that is also concerned with the world and intellectual development of individuals, added that, skill can be knowledge possessed, proper training or experience in something causing a distinct difference that should be of importance to matter. Okorie (2000) is of the view that to possess a skill is to demonstrate the habit of acting, thinking and behaving in a specific activity in such a way that the process becomes natural to the individual through repetition or practice. Okorie further explained individuals who opt for skill training should among other things possess all qualities such as interest, ability, aptitude, patience, personal characteristics and other human/physical qualities that would enable them to succeed in it. Far from the misconceptions that development of skills only requires dull brains, rather skills acquisition needs intelligent humans as it present great challenges to learners on the integration of practical work to the theoretical field.

Nworgu (1991) observe that an appropriate skill is always applied to each component trade available because, the demand for skill-acquisition in every practical

activity is necessary, considering the fact that, different output requirement for each sub-sector demands different input of skill also, Olaitan (1996) observed that all occupations require the use of skill and application of some technical and manipulative skills to achieve the aims of the work undertaken. Skills therefore is a manifestation of acquired knowledge which is translated into practical activity that enables individuals to acquire know how of variety of skill concepts which is related to a particular trade or occupation.

2.5 Teacher's Role in Technical and Vocational Skill Acquisition

Teachers have great role to play in improvising teaching materials that are inadequate or not available in the laboratory and workshop because according to Drawbought and Hull (1971) lack of expendable items in the laboratory and workshop dampens students' enthusiasm. The absence of equipment in laboratory and workshop reduces teacher effectiveness, there by resulting into non-professional. Treble (1981) indicated that technical and vocational teachers need to add new strategies that relate to students daily activities. Technical and Vocational teachers should teach skills to students in problem- solving and the importance of following direction.

Guster (1986) advised that technical and vocational teachers should determine students learning styles and match the instructional techniques most appropriate for them using a profile of learning characteristics. A learning style is the way each person absorbs and retains information's and skill. According to Wager and Kicklither (1986) at the beginning of a class, technical and vocational teacher should provide specific directions and some what complete planning material for students' construction activities. The students can work on their own when information are made available to them by the teacher. Osborn (1987) viewed skill acquisition by students is a major concern in technical vocational education; technical teachers must have the experience and confidence to demonstrate the needed skills to students and to supervise students practice.

Jacobson (1989) observed that learning is an internal process, therefore, teachers disseminate information, demonstrate and model appropriate behaviors and facilitate that

which students think and do intellectually, attitudinally, and physically. Teachers utilize what paves the way for students transfer from what he / she does to what he / she becomes. Jacobson further stressed the use of management and defined it as a complex set of plans and actions that a teacher uses to ensure effective and efficient learning.

2.6 The use of Engine Model in the Development of Skills

Gokum and Shittu (2008), stated that using engine model as learners' aid gives the members of the class the chance to share their experiences may lead to development of skills, attitude, opinion and values about what they observe, see and touch. In the same vein, Danmole (1992) reported that the use of engine model improve the quality of teachers instruction. Hiti in Peterson (1990) asserts that engine model elicit and sustain the learners interest.

Keziah (2004) stated the following suggestions for using model in the classroom.

i. Select and use only models that are good representative of the real things you have in mind. The more natural and realistic the models are, the greater their impact. Select models that would assist understanding.
ii. Use models in any teaching situation in which the senses of touch and sight would aid teaching-learning process.
iii. Employ models only when the use of real things is hundred.
iv. Make sure that people are seeing the model very well and understanding what they are looking at.
v. When not in use, store models in a safe place in the workshops and laboratories.

Abimbade (1997) stated that the primary purpose of using instructional material, in the teaching-learning process is to make teaching more effective and to facilitate learning. It does not do the whole job because it cannot entirely replace the human teacher in the classroom. These teaching materials are administered and controlled by the teacher. If it is well selected and used accordingly, it works. Teachers should select and use materials which would enable the learners to master the desired objectives.

Olaitan et al. (1999) stated that proper usage of instructional materials, serves various purposes in the teaching and learning process. These include:

i. Demonstration of specific skills
ii. Carrying out manually operated functions
iii. Providing supportive functions to the functioning of used equipment and tools
iv. Performing mechanically operated activities
v. Hiding students skill development activities
vi. Promoting students memory development and recall.
vii. Aiding the construction and production purposes
viii. Evaluating success of skill acquisition. (Pp 270-271). Saunders in Usman (2008) stated that the use of engine model facilitate better understanding, capture more authentic information and generally sharpen intelligence. In another development, Fagbeza (1998) observed that the present situation in the workshop gives the impression that inspite of the invaluable contribution engine model make towards effective classroom and workshop learning, some teachers are not in the habit of using them in their teaching process.

Most teachers are not adequately exposed to the knowledge and skill about the production, management, selection, operation and utilization of engine models such teachers are not adequately aware of the vital roles of engine model played in automobile technology education.

Enemali (2006) stated that teaching is the processes of communication in the sense that it requires effective presentation of stimuli and eliciting of learners responses, communication, effective teaching or development of skills situation has four components.

- The teacher (Sender).
- Learner (Receiver)

- Subject matter (Massage) and
- The teaching methods (medium)

Development of skill is much more than mere processes of transmitting knowledge to the learner. Uyanga in Enemali (2006) observed that teaching is the art of using media to sensitize the learner towards assimilation and retention of facts, concepts, theories and principles taught. The ultimate criterion of effective development of skills is the teachers' impact upon the learners learning, in other words, development of skills or teaching a skill is effective to the extent to which the presentation, explanation, discussion and ordering of elements of the task to be learned approach the optimum for the individual learner.

On the other hand, effective learning is considered as a modification of a person's behaviour so that the behaviour is changed on a more permanent basis. According to Engestrom (1994), the learner literally constructs a picture of the subject matter and forms explanations, models of its elements and sequence. He selects and interprets information. The learner always ends up correlating and merging acquired subject matters into his ongoing activity, and earlier construction.

2.7 Review of Related Empirical Studies

Adedokun (2007) conducted a research titled: Correlation between theory and practice of teaching skills for effective technical and vocational Education reform. The purpose of this study was to find out the extent to which the general knowledge of specific course contents can be used to predict the demonstration of some expected teaching skills. The data were analyzed using mean and standard deviation for answering research question, t- test and analysis of variance (F-test) were used for testing the null hypothesis at 0.05 level of significance.

The findings of the study were:

(i) The postgraduate students teachers in training perform significantly better in theoretical aspects of teaching skills than in practical demonstration.

(ii) The postgraduate students perform better in theoretical aspects of lesson preparation, presentation and classroom management skills while they are relatively weak in communication and evaluation skills.

(iii) The weakest area of the postgraduate students, both in theory and practice is in the communication skills.

Chiaka (1998) conducted a research titled. Job-seeking skills needed by university graduates for gainful employment.

The purpose of this study was to:

(i) Identify and validate job application skills that help university graduates to be invited to interview.

(ii) Identify and validate interview skills employed by some university graduate. Mean and standard deviation were used to answered research question, while t-test was used to answer hypothesis.

1. The finding reveals that the most important pre-application and application skills as perceived by the graduates were locating job vacancies
2. The importance of the interview and skills possessed by the graduate.

Another research conducted by Agbarevo (1998) Titled, analysis of strategies for making practical Agriculture interesting in secondary school in Abia State. The purpose of the study was primarily to find out the strategies of encouraging secondary school students and getting them to become more interested in practical Agriculture.

The data were analyzed using mean and standard deviation

The major findings of the study are as follows:

1. There is no significant difference between the mean ratings agricultural science students and teachers regarding strategies to be employed in order to generate interest among students in practical agriculture at 95% confidence level. This is because the calculated t for each of the variables was less than the table t of 1.98.

2. The student and teachers were unanimously in their opinion that twelve of the twenty strategies identified were of high importance in making practical agriculture interesting in secondary schools.

Isah (2006) conducted a research titled: Teachers competency in the utilization of instructional materials, in automobile technology. The purpose was specifically to find out the qualification, competency of automobile teachers and availability of instructional materials and their utilization. Mean and standard deviation were used to answer the research questions and t-test was used to test the null hypothesis at 0.05 level of significance.

Finding of the Study

The findings revealed

1. That the teachers are qualified by having relevant qualifications for the teaching of automobile technology
2. Instructional materials are not available to utilize by the teachers in teaching and learning of automobile technology.

Shittu (2008) conducted a research titled: Technology skill improvement needs of metal work technology teachers in technical colleges in Lagos and Ogun States for the realization of vision 2020. The data collected from the questionnaire were analyzed using mean and standard deviation to answer each of the three research question formulated for this study. However, the t-test was used for testing the null hypothesis at probability of 0.05 levels of significances.

Findings of the study

1. Metal work technology teachers in technical colleges need modern metalwork students in technical colleges for occupation in metalwork industry and productive self employment. Some of the modern metalwork technology skills needed area.

i. Assess larger networks and on microprocessors in onboard diagnosis (OBD) computer system in modern vehicles.

ii. Identify and use relay to execute commands that is interdependent of sensors (input) control unit and actuators (output).

iii. Diagnose and repair faults in the engine control with diagnostic scan tools and engine analyzer.

iv. Use a modern spark to verify voltage in the distributor.

v. Troubleshoot computerized transmission controller using light emitting diodes (LED) test lights.

2. The pedagogical skills needed by metalwork technology teachers in the technical colleges in Lagos and Ogun States to enable them teach well in their specialized occupation include

i. Examine curriculum of the training programme module.

ii. Establish objective of instruction.

iii. Select and use relevant instructional method to linking the previous experience (old technology skills) with new lesson (new technology skills).

iv. Assess learner's performance.

v. Provide justified feedback to learner on their performance in the test.

2.8 Summary of Related Literature Reviewed

The study is link to Thorndike law of practical exercise, the more practices students has the more they learns. The more practical lessons students carry out in Automobile Technology Education the more they become proficient. This enables the student to be exposed to skill acquisition in automobile Technology education. Practical lesson in any teaching and learning activity which involves students in manipulating real objects and materials. The term psychomotor which deals with skills is placed between two terminals of skill continuum. More so, the relationship between skill and performance is that skill is

the sequence of responses required for a specific task, then performance is the configuration of task. Performance is here defined as an organized sequence of activities.

The engine model which serves as an instructional materials used in teaching and learning of automobile technology education. Teachers improvise teaching materials where possible in the laboratories and workshops. Technical and Vocational Teachers need to add new strategies, that relate to students day-to-day activities to enable them teach skills to students in problem-solving. The effective skill developments has four components which includes, the teacher (Sender), the learner (receiver), the subject matter (massage) and the teaching method (medium), development of skill is the process of transmitting knowledge to the learner. The study reviewed some empirical works eg. Adedokun conducted a research titled, correlation between theory and practice of teaching skills for effective technical and vocational education reforms. From the literature reviewed, I have not come across a topic on engine model. Therefore, this study examined the role of engine model in the teaching and learning of Automobile technology in Colleges of Education (Technical).

CHAPTER THREE

METHODOLOGY

This chapter contains the methods and procedures that were employed in conducting the study. This was presented under the following sub-heading: design of the study, area of the study, population of the study, sample and sampling techniques, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and method of data analysis.

3.1 Design of the Study

The design of the study was survey research method. According to Nworgu (1991) opinion survey finds out the opinion of people towards an issue or event that is of interest for the generality of the populace. The design is therefore considered appropriate for this study.

3.2 Area of the Study

The study was carried out in North-Eastern States of Nigeria. It comprises Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States, with a total number of 5 colleges of Education offering Automobile Technology as course of study in the zone. The North East has geographical boundary of latitude 6.26^0 East and longitude 4.92^o North of the equator with total area 103,639sq. miles according to Nigeria North East 2012.

3.3 Population of the Study

The population for this study was 195 respondents. There are 12 Lecturers and 45 students from F.C.E. (T) Potiskum, 8 Lecturers and 37 students from F.C.E. (T) Gombe, 3 Lecturers and 25 students from COE Hong, 3 Lecturers and 28 students from COEST Bama, 4 Lecturers and 30 students from COE Azare. Given the numbers of 30 lecturers and 165 N.C.E III students 2009/2010 session offering Automobile Technology Education. According to Akuezuilo and Agu (2003), when a population of study is small

and can be conveniently handled by the researcher, it becomes necessary to study the entire population. Therefore in this study, the entire population was used for the study.

3.4 Instrument for Data Collection

A questionnaire having five points rating scale, named "The Role of Engine Model Rating Scale (R.E.M.R.S) for colleges of Education were developed after literature reviewed. The R.E.M.R.S instrument was to examine the role of Engine Model in the teaching and learning of Automobile Technology in Colleges of Education in North-Eastern States of Nigeria.

The questionnaire was divided into two parts: Part I was used to collect personal information of the respondents, while Part II was designed to collect information that was used to answer research questions. The response categories of the instrument were assigned values as follows:

Scale	Lower limit	Upper limit
Strongly agree 5 points	4.50	5.49
Agree 4 points	3.50	4.49
Undecided 3 points	2.50	3.49
Disagree 2 points	1.50	2.49
Strongly disagree 1 point	0.50	1.49

3.5 Validation of the Instrument

The validity of the instrument for this study was established through face validation. Draft copies of the instrument were given to three experts for corrections, comments and advices. The experts were made up of one lecturer in the Department of Technology Education, Modibbo Adama University of Technology, Yola, one from Federal College of Education (Technical) Potiskum, and a lecturer from Abubakar Tafawa Balewa University Bauchi. The comments, advice, and suggestion of the

validators, example question items, grammatical errors, and spellings were used by the researcher for the development of the final instrument for the study.

3.6 Reliability of the Instrument

The reliability of the validated instrument was determined using, the split half technique. The instrument was administered to 16 respondents from Ramat Polytechnic Maiduguri, School of Technical Education Automobile Department, the items was split into two that is even and odd numbers. The results of two halves were correlated using the spearman's rank order correlation coefficient. The formula was given as:

$$p = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

Where

p = spearman rho correlation

n = number of pair items.

d = difference between the ranks of x and y and

6 = a constant

Source: Uzoagulu (1998)

The correlation coefficients were corrected by the application of the spearman's brown prophecy formula which was:

$$r_t = \frac{2r}{1+r}$$: where

r_t = reliability of the whole test and

r = correction coefficient of the split test.

Source: Akuezuilo and Agu (2003)

The analysis of data yielded reliability coefficient of 0.86, 0.78, 0.83 and 0.91 for each research questions respectively. The instrument yielded grand mean of 0.85.

3.7 Method of Data Collection

Data for the study were collected through direct administration of questionnaire by the researcher to the respondents. The researcher use research assistants which ensure immediate collection and return of the completed copies of the questionnaire. The researcher gave one week to the respondents to complete. The researcher returned to collect the completed copies of the instrument. He collected 188 out of 195.

3.8 Method of Data Analysis

The analysis of the data collected was carried out using mean and standard deviation for answering research questions. Z-test was used to test the null hypothesis at 0.05 level of signific**********ant. The limit of assigned value of response categories were used to make decision on the role of engine model in the teaching and learning of automobile technology education, the value of 3.50 which is the lower limit of agree category was used. Calculated Z-test was obtained using the formula below:

$$Z = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where

$\overline{X_1}$ = mean of the first group or sample.

$\overline{X_2}$ = mean of the second group or sample.

n_1 = sample size of the first group or sample.

n_2 = sample size of the second group or sample

S_1^2 = standard deviation of the first group or sample.

S_2^2 = standard deviation of the second group or sample.

Source: Uzoagulu (1998)

The decision rule on the response categories on the role of engine model in the teaching and learning of automobile technology, the value of 3.50 being the lower limit of agreed were used. Any mean response that is 3.50 and above was regarded as accepted. While any mean response of 3.49 and below were regarded as rejected.

The calculated Z-test were compared to the table Z- value when the calculated Z-test is less than the table Z-value, the null hypothesis is accepted and otherwise the null hypothesis was rejected.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter contains the analysis of data collected in respect of the research questions and hypotheses in the study.

4.1 Research Question I

To what extent does engine model expose students to practical techniques of automobile engine?

Table I: Mean Ratings of Lecturers and Students on the Extent to Which Engine Model Expose Students to the Basic Knowledge of Practical Techniques

S/No	Item statement	$\overline{X}_L$	S_1	$\overline{X}_S$	s_2	$\overline{X}_G$	Remark
1	Engine model helps to facilitate teaching and learning in Automobile technology.	4.10	1.18	4.11	1.16	4.10	Strongly Agree
2	Student's performances are usually better, when right models are used as teaching aid.	3.93	1.14	1.14	0.94	4.05	Strongly Agree
3	The attention of students are drawn using models as instructional materials in teaching.	3.96	0.96	4.29	0.85	4.11	Strongly Agree
4	The working model of an engine represents						

	the life engine which helps students to understand the working principles of the engine.	3.80	1.12	4.31	0.91	4.06	Strongly Agree
5	Students identify the basic component Parts of the engine model as they see it physically.	3.90	1.29	4.46	0.92	4.18	Strongly Agree
6	The students will be able to have the knowledge and skills on how to make repairs and maintenance aspect of automobile engine.	3.73	1.11	4.20	1.03	3.97	Agree
7	Overhauling of engine is demonstrated to students during practical lessons with engine model.	3.80	1.24	4.23	0.91	4.02	Strongly Agree
8	Students can identify some faults in the engine after graduation when taught practical with engine models in your college.	3.93	0.98	4.21	0.81	4.07	Strongly Agree
9	Students are exposed to						

	the functions of each component of engine.	3.80	1.29	4.31	0.78	4.06	Strongly Agree
10	Students are sent for excursion or industrial visit to see different types of engine models in the industries.	2.60	1.06	2.74	1.49	2.67	Disagree
11	Practical lessons promote team work among students in your college.	3.83	1.23	4.12	0.84	3.96	Agree
12	In using engine models, the students identify the position of each components of the engine	3.53	1.16	4.07	0.77	3.80	Agree
13	The engine model allows the class members to share ideas equally from the same teaching experience.	3.70	1.17	3.98	0.92	3.84	Agree
14	The use of engine models promote retention of learned skills and knowledge among students.	3.76	1.13	4.12	0.92	3.94	Agree
15	Engine model helps the						

	learners to develop the ability to think critically when used to teach them practical lessons.	3.73	1.22	4.27	0.72	4.00	Strongly Agree
16	When students are exposed to the basic use of engine models they should be able to teach automobile engine after graduation in post primary schools.	3.89	1.15	4.08	0.92	3.99	Agree
17	The students find it costly to produce models in automobile workshop during practical class.	3.53	1.33	3.88	1.00	3.74	Agree
18	Engine models provide opportunity for inquiry in teaching and learning of automobile technology when students are exposed to it.	4.03	0.99	4.06	0.84	4.05	Strongly Agree
19	Engine model supplies avenues for further						

	practical exercises in Automobile technology.	3.85	1.05	4.06	1.02	3.78	Agree
20	Engine models help in visualizing class work by showing its application practically.	3.93	1.14	4.04	0.94	3.99	Agree

Where $\overline{X}L$ = mean ratings for lecturers

$\overline{X}s$ = mean ratings for students

S_1 = Standard deviation for lecturers

S_2 = Standard deviation for students

$\overline{X}_G$ = Grand mean

n_1 = Number of lecturers

n_2 = Number of students

n_1 and n_2 are the numbers of lecturers and students that respond to the questionnaire. Table I above shows that the responses for 19 item statements were each rated above 3.50 which was agreed, and only I item statement was rated below 3.50 and was disagree. This result revealed that the respondents were of the opinion that engine model exposed the students to the basic practical techniques in the teaching and learning of automobile technology in colleges of education.

4.2 Research Question 2

To what extent do teachers use engine model to teach students automobile technology.

Table 2: Mean Ratings of Lecturers and Students on the Extent to Which Engine Model Would be use by Teachers for Teaching to teach the Students to a Wide Range of Automobile Engine Learning Experiences

S/No	Item statement	$\overline{X}_L$	S_1	$\overline{X}_S$	S_2	$\overline{X}_G$	Remark
21	Teaching using engine models increases efficiency by stimulating the condition for the learner to learn.	4.10	0.99	4.06	0.91	4.08	Strongly Agree
22	The engine model provides teachers with the opportunity of exposing students to a wide range of learning experience.	3.93	1.14	4.14	0.78	4.04	Strongly Agree
23	Engine model helps the teachers to provide their students with a meaningful and realistic source of information.	4.10	1.06	4.22	0.81	4.16	Strongly Agree
24	Teachers are sent for						

	refresher courses to update their knowledge on the use of new engine models in automobile technology.	2.66	1.18	2.62	1.14	2.64	Disagree
25	Engine model brings close experts and other learning resource to the classroom through workshops and seminars.	3.60	1.27	3.62	1.00	3.61	Agree
26	Engine model helps to save time and energy of the teacher by limiting the use of wordy explanation.	3.70	1.26	4.01	1.93	3.86	Agree
27	The engine model provides correct specification of real objects in automobile technology.	3.70	0.99	4.29	0.67	4.10	Strongly Agree

Where $\overline{XL}$ = mean ratings of lecturers

$\overline{Xs}$ = mean ratings of students

S_1 Standard deviation for lecturers

S_2 standard deviation for students

$\overline{X}_G$ = Grand mean

n1 = Number lecturers

n2 = Number students

n1 and n2 are the numbers of lecturers and students that respondent to the instrument. From the analysis of table 2 above, six of the seven item statements were each rated above 3.50 the result revealed that when teachers uses engine model effectively in teaching, it would expose the students to a wide range of automobile learning experience in colleges of education.

4.3 Research Question 3

How adequate are engine models used for the teaching and learning of automobile technology in colleges of education?

Table 3: Mean Ratings of Respondents on the Adequacy of Engine Model in the Teaching and Learning of Automobile Technology

S/No	Item statement	$\overline{\overline{X}}_L$	S_1	$\overline{X}_S$	S_2	$\overline{X}_G$	Remark
28	The number of engine models found in your school for students practical in automobile workshop is adequate.	2.33	1.00	2.45	1.14	2.34	Disagree

29	The number of engine parts produced by students as a model during practical lessons in your college is adequate.						
		2.40	0.89	2.75	1.14	2.58	Disagree
30	The number of tools and equipment found for practical lessons in automobile technology are available in the workshop.						
		2.53	1.25	2.43	1.18	2.48	Disagree
31	The functional parts of engine produced by students in your school are adequate						
		2.17	0.94	2.39	1.28	2.28	Disagree

Where $\overline{X}$= mean ratings of lecturers

$\overline{X}s$= Mean ratings of students

S_1= Standard deviation for lecturers

S_2= Standard deviation for students

$\overline{X}_G$= Grand mean

n_1 = Number of lecturers

n_2 = Number of students

n_1 and n_2 are the number of lecturers and students that respond to the instrument. In table 3 above the mean of each of the 4 items statement have been rated below 3.50.

This result shows that engine models for the teaching and learning of automobile technology in colleges of education are in adequate.

4.4 Research Question 4

What appropriate methods of teaching to be adopted using engine model in automobile technology?

Table 4: Mean Ratings of Respondents on the Appropriate Methods of Teaching to be Adopted Using Engine Model in Automobile Technology

S/No	Item statement	$\overline{X}_L$	S_1	$\overline{X}_S$	S_2	$\overline{X}_G$	Remark
32	Engine model can be used by teachers for individualized learning.	3.83	0.83	3.87	1.06	3.85	Agree
33	Engine models by demonstration help the learner develop creative thinking skills in automobile technology.	4.43	0.50	3.87	1.06	4.15	Strongly Agree
34	An effective method of teaching to be adopted using engine model is by grouping the students in the class.	4.20	0.80	4.03	0.84	4.12	Strongly Agree
35	Teachers can use discovery method in teaching using models.	3.50	0.97	3.72	1.12	3.61	Agree

36	Lecture method using engine models in teaching and learning of automobile technology helps students to acquire more knowledge and skills.	3.37	1.18	3.15	1.28	3.26	Agree
37	Teaching large class size using engine models is the appropriate method to be adopted in automobile technology.	2.63	1.27	2.90	1.35	2.77	Disagree
38	Questioning techniques is one of the effective methods of teaching to be adopted using engine models in automobile technology.	2.77	1.19	2.93	1.20	2.85	Disagree

Where $\overline{X}L$= mean ratings of lecturers

$\overline{X}s$= Mean ratings of students

S_1= Standard deviation for lecturers

S_2= Standard deviation for students

$\overline{X}_G$ = Grand mean

n_1 = Number of lecturers

n_2 = Number of students

n_1 and n_2 are numbers of lecturers and students that responded to the instrument. Based on the opinions of respondents as shown in table 4 above, the mean of each of the 4 item statement have been rated above 3.50 which is accepted, while 3 items statement were rated below 3.50 and is rejected.

This result revealed that items 32,33,34 and 35 are the best methods to be adopted in the teaching and learning of automobile technology using engine models in colleges of education, where the remaining are rejected.

4.5 Hypothesis 1

There is no significant difference between the mean response of lecturers and NCE III students on the extent to which engine model expose students to the basic knowledge of practical techniques of automobile engine.

Table 5: Z-test Result Comparing Mean Opinion of Respondents on the Extent to which Engine Model Expose the Students to the Basic Practical Techniques of Automobile Engine

Subject	**N**	**$\bar{x}$**	**Df**	**s**	**Standard error**	**Z-cal**	**Z- crit**	**Remark**
Lecturers	30	3.75	186	1.14	0.21	0.80	1.96	Accept
Students	158	3.58		0.93				

The analysis of table 5 above shows Z-Calculated value of 0.80 at 0.05 level of significant while the Z-Critical yielded a value of 1.96. Since the value of Z-calculated is less than the value of Z-critical the null hypothesis is retained, this implies that there is no significant difference in the mean opinion of lecturers and NCE III students on the extent

to which engine model exposes the student to the basic practical techniques of automobile engines in college of education in the North-Eastern States of Nigeria.

4.6 Hypothesis 2

There is no significant difference between the mean scores of lecturers and NCE III students on the extent to which teacher's uses engine model for teaching to teach students to a wide range of automobile learning experience.

Table 6: Z-test Result Comparing the Opinions of Lecturers and NCE III Students on the Extent to which Teachers Used Engine Model for Teaching

Subject	**N**	$\bar{x}$	**df**	**s**	**Standard error**	**Z-cal**	**Z-crit**	**Remark**
Lecturers	30	4.01	186	1.12				
					0.22	0.76	1.97	Accept
Students	158	3.85		0.89				

Table 6 above shows that Z-calculated value of 0.76 at 0.05 level of significance while the Z-critical value is 1.97. This shows that the value of Z-calculated is less than Z-critical; therefore, the null hypothesis is retained. This implies that there is no significant difference in the mean opinion of lecturers and NCE III students on the extent to which teacher uses engine model for teaching to expose students to a wide range of automobile learning experience in colleges of education.

4.7 Hypothesis 3

There is no significant difference between the mean response of lecturers and NCE III students on the adequacy of engine model in the teaching and learning of automobile technology.

Table 7: Z-test Result Comparing Mean Opinions of Responses on the Adequacy of Engine Model in the Teaching and Learning of Automobile Technology

Subject	n	$\overline{x}$	df	S	Standard error	Z-Cal	Z-crit	Remark
Lecturers	30	2.33	186	1.02	0.20	1.15	1.96	Accept
Students	158	2.10		1.20				

In table 7 above, the calculated Z-value was 1.15 against the Z-critical value of 1.96 at 0.05 level of significance. Since the calculated value is less than the value of Z-Critical, the null hypothesis is accepted and we conclude that there is no significant difference in the mean opinions of lecturers and NCE III students on the adequacy of engine models for the teaching and learning of automobile technology in colleges of education.

4.8 Hypothesis 4

There is no significant difference between the mean scores of lecturers and NCE III students on the appropriate methods of teaching to be adopted for teaching automobile technology using engine model.

Table 8: Z-test Result Comparing Mean Opinions of Responses on the Appropriate Methods of Teaching to be Adopted Using Engine Model in Automobile Technology

Subject	**n**	**$\bar{x}$**	**df**	**S**	**Standard error**	**Z-Cal**	**Z-crit**	**Remark**
Lecturers	30	3.53	186	0.96	0.2	0.20	1.94	Accept
Students	158	3.49		0.94				

In table 8 above, it showed that the Z-calculated was 0.20 as against the corresponding Z-critical value of 1.94 at 0.05 level of significance in this case, the null hypothesis is accepted while the alternative hypothesis is rejected. This implies that there is no significant difference in the mean ratings of lecturers and NCE III students on the appropriate techniques or methods to be adopted in the teaching and learning of automobile technology in colleges of education.

4.9 Findings of the Study

Based on the analysis of data collected, the following findings were revealed.

1. The model of an engine represent the live engine which helps students to understand the working principles of the engine
2. The students are not exposed to basic components parts of the engine physically using engine model, most of them have not seen engine model before.

3. Most students are not sent for industrial visit to see different types of engine models in Colleges of Education before graduation to acquire skills.
4. Engine model has not been effectively used by teachers instead of real engine in teaching and learning to provide students with meaningful and realistic source of information
5. The teachers are not sent for refresher courses to update their knowledge on the use of engine models to teach students practical lesson in automobile technology.
6. The number of engine models found in colleges for practical lesson in automobile is inadequate.
7. Demonstration method is the best method of teaching using engine model.

4.10 Discussion of the Findings

Based on the issues raised in the purpose of this study, the findings were discussed. In table I result shows that the responses for 19 item statements were each rated above 3.50, while only I item statement rated below 3.50. This result reveals that the respondents were of the opinion that teaching using engine model exposed the students to basic practical techniques of automobile engine in colleges of education. The implication of this finding is that, students should be taught practical lessons using engine model and also sent for industrial visit or they may not achieve the maximum skills acquisition in automobile before graduation. This findings agree with Sunders in Usman (2008) that the use of engine model in teaching facilitate better understanding, capture more authentic information and generally sharpen intelligence. The students are exposed to basic practical techniques of automobile when models are used in teaching and learning.

Table 2 shows the analysis of mean rating of the respondents, out of six, of the seven item statements were each rated agree that when teaches used engine model in teaching and learning, it exposes the students to a wide range of automobile learning experiences. This result is in line with Fagbeza (1998) who observed that the present situation in the workshops gives the impression that in spite of the invaluable contributions engine model

make towards effective classroom and workshop learning, some teachers are not in the habit of using them in their teaching process. Finally, the implication for this study shows that lack of use of engine model in teaching and learning of automobile by teachers affect the performance of the teachers in delivering their practical lessons in which students may not be fully expose to wide range of automobile learning experience.

According to the opinions of the respondent in table 3 the result shows that engine models for the teaching and learning of automobile technology in colleges of education are inadequate. Okwelle (1994), who observed that where instructional materials are not adequately provided, technical programmes suffered and lead to wastage of production. He stressed further that science and technical courses are practical oriented discipline and their effective teaching could only be guaranteed if necessary instructional materials are made available. Similarly, Adirieje (2006) pointed out that for a nation to grow, there must be sound technological know how, this of course can be achieved, if the learners are equipped with the needed instructional materials to work with.

This finding showed that engine models are not available in colleges of education for teaching and learning which led to the production of unskilled graduates who are unproductive. Thus it means that colleges of education will continue to turn out in competent graduates of automobile technology who cannot effectively teach using engine model unless this gab is bridged by providing adequate engine models to enable them carry out effective teaching

Table 4 shows the analysis of the mean rating of respondent on appropriate methods to be adopted in using engine model in automobile technology. The result revealed that 4 of seven item statements are the best methods to be adopted in teaching and learning of automobile technology. This position is in line with Enemali (2006) who stated that a training program is more effective when the right participants receive the right knowledge, attitude and skills taught by means of the right methods, media and instructors at the right time and are placed so as to meet or exceed the organizations

expectations. This finding shows that teachers should use appropriate methods in teaching and learning using engine model.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

In this chapter, summary of the statement of the problem, the procedure used in conducting the study as well as summary of the analysis of the work are presented. The chapter also presents the recommendation for action, implication for the study and suggestion for further study.

5.1 Re-statement of the Problem

The engine model as an instructional material that used various senses which is used in teaching automobile practical in technical colleges of education. According to Obunneke (2000), teaching and learning is said to be effective when two or more senses are impinged upon It was found that real engines are not available in teaching practical in automobile workshop in colleges of education technical that offer automobile technology, in line with this, the use of engine model in the teaching and learning of automobile technology in colleges of education would go along way in enhancing student learning of the trade. Therefore, this study aimed at examining the role of engine model in terms of the extent to which engine model expose students to the basic knowledge of practical techniques of automobile engine, the extent to which engine model would be used by teachers for teaching to expose the students to a wide range of automobile engine learning experiences the adequacy of engine model for teaching and learning of automobile and the appropriate methods of teaching to be adopted using engine model in automobile technology.

5.2 Summary of Procedure used for this Study

Opinion survey research design was used in conducting this study. It was for the role of engine model in the teaching and learning of automobile technology in colleges of education in the North-Eastern state of Nigeria.

The researcher came up with four purposes of the study, four research questions and four hypotheses which guided the study. Literature ware reviewed based on the study,

questionnaire items as research instrument were generated. The questionnaire was divided into two parts, part I to collect personal data of the respondent, While part II was to collect information used to answer research questions. Three experts in technology education validated the research instruments. Their comments, advice and suggestions were used for the development of the final instrument for the study. After which the reliability of the developed instrument was determined using 16 respondents from department of technical education Ramat polytechnics Maiduguri.

The population for the study was made up of 195 respondents, 30 lecturers and 165 NCE III students automobile which were drawn from five colleges of education that offer automobile technology in the North-Eastern State of Nigeria. The researcher was able to collect back 188 questionnaire from the respondents. The data collected were analyzed using mean, and standard. Deviation for answering research questions while Z-test was used to answer the hypothesis formulated for the study.

5.3 Summary of Major Findings

After the result of data analyzed the study came up with the following major findings:

1. The students are not exposed to basic component parts of the engine physically using models, most of them have not seen engine model before.
2. Engine model has not been effectively used by teachers in teaching and learning of Automobile Technology.
3. The engine models for the teaching and learning in colleges of education are inadequate.
4. Demonstration method is the best method of teaching using engine model.

5.4 Conclusion

This research work has examined the role of engine model in the teaching and learning of automobile technology in colleges of education in North-Eastern State of Nigeria. Based on the findings, this study shows that when engine model is used as instructional material in the teaching and learning of automobile it would expose the students to the basic practical techniques of automobile engines in colleges of education. It was also discovered that students are not sent for industrial visit to see different types of engine models which would have helped them to acquire more skills.

It was also discovered that if teachers used engine in teaching, the student would be exposed to wide range of learning experiences in automobile engines. There is a problem of inadequate supply of engine model for the teaching and learning of automobile technology in colleges of education which would in turn hinder the students of these colleges from acquiring the needed practical skills in their occupational trade.

Finally, teachers should use engine model in teaching and learning of automobile technology and government should provide engine model for effective teaching of automobile practical's.

5.5 Implications of the Study

The result of the findings of this study has provided useful educational implications. It has revealed principally that engine model are inadequate in colleges of education for teaching and learning. It was also revealed that students are not exposed to maximum skill acquisition because teachers do not effectively use engine model in the teaching and learning of automobile technology. Teachers are not sometime using right method in teaching automobile practical.

In this situation therefore, the findings of this study have provided important implication to the stakeholders in charge of colleges of education in planning and implementation of educational programmes such as national commission for colleges of education (NCCE), provost of colleges of education, lecturers of automobile technology

and students. Instructional materials should be assessed from time to time to determine their functionality and availability for teaching and learning of automobile technology.

6.5 **Recommendations**

The following recommendations were made based on the findings of the study.

1. That students should be exposed to the basic practical techniques of automobile engines in teaching using engine models
2. That teachers should effectively use engine models for the teaching and learning to expose students to a wide range of automobile learning experience.
3. That the college managements should provide adequate engine models in colleges of education for the teaching and learning of automobile technology.
4. That teacher should used demonstration method in teaching using engine models.

5.7 Suggestions for Further Study

The researcher suggests the following for investigation in order to carry out further studies in automobile technology.

1 An item analysis of multiple choice questions in automobile technology in colleges of education.

2 The role of computer animation in teaching and learning of automobile technology in technical colleges in north eastern states of Nigeria.

3 The effectiveness of power point presentation in teaching and learning of automobile technology education in colleges of education in the north eastern state of Nigeria.

5.8 Limitations of the Study

In the processes of this study, it was observed that some of the lecturers are not aware of the use of engine models in teaching, and learning in automobile technology and the students were not exposed to the use of engine model in acquisition of maximum skills on automobile engines.

There was limited number of automobiles technology departments. Therefore, the researcher had limited people that responded to the instrument prepared for this study. There are no enough human and material resources in automobile technology departments in colleges of education in the North-Eastern States of Nigeria.

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APPENDICES

A. Letter

Department of Technology Education,

Modibbo Adama University of Technology,

Yola.

22nd January, 2010.

Dear Respondent,

REQUEST TO RESPOND TO QUESTIONNAIRE

I am a postgraduate student of the Department of Technology Education, Modibbo Adama University of Technology, Yola.

The main purpose of my study is to examine the role of engine model in the teaching and learning of Automobile Technology in Colleges of Education in the North-Eastern States of Nigeria.

Your response to the items on the attached questionnaire is very important for a successful conduct of the study. I therefore kindly request you to respond to all the items as objectively as possible.

All information given by you will be treated with strict confidentiality and for the purpose of the research work only.

Thanks for your assistance.

Yours Sincerely,

Abdullahi Mamuda

B. Questionnaire

QUESTIONAIRE ITEMS ON THE ROLE OF ENGINE MODEL IN THE TEACHING AND LEARNING OF AUTOMOBILE TECHNOLOGY IN COLLEGES OF EDUCATION IN NORTH-EASTERN STATES OF NIGERIA

To be completed by Lecturers and Students.

(i) Please tick the appropriate option.

(a) Lecturer [ ]

(b) Student [ ]

(ii) Please indicate your highest qualification.

(a) H.N.D. [ ]

(b) B.SC / B. Ed / B. Tech [ ]

(c) M. SC / M. Ed / M. Tech [ ]

(d) PhD [ ]

(e) N.C.E. III (Tech) Automobile[ ]

(f) Others (specify)……

(iii) Teaching experience.

(a) Below 5 years [ ]

(b) 6 – 11 years [ ]

(c) 12 – 17 years [ ]

(d) 18 – 23 years [ ]

(e) 24 – 29 years [ ]

(f) 30 – 35 years [ ]

The questionnaire items below are sub-divided into four sections. The purpose is to examine the role of engine model in the teaching and learning of Automobile Technology in Colleges of Education in the North- Eastern States of Nigeria

SECTION 1

The extent to which engine model exposes students to practical work on automobile engines.

The response options from section {1 to 4} are: strongly Agreed (SA), Agreed (A), Undecided (UN), Disagreed, (D), and strongly disagreed (SD).

Please indicate by ticking (√) the level to which you agree or disagree on the extent to which engine model exposes students to practical work on automobile technology.

S/N	Item Statement	SA	A	UN	D	SD
1	Automobile engine model helps to facilitate teaching and learning in Automobile Technology					
2	Students performance are usually better, when automobile engine model is used as teaching aid.					
3	The attention of students are when using automobile engine models as instruction materials.					
4	The working model of an engine represents the life engine which helps students to understand the working principles of the engine.					
5	Students identify the basic component of an automobile engine model as they see it physically.					
6	The students would be able to have the knowledge and skills on how to make repairs and maintenance aspect of Automobile engine.					
7	Overhauling of engine is demonstrated to students during practical lessons with engine model.					
8	Students can identify some faults in the engine after					

	graduation when taught practical with an automobile engine models in technical college of education.					
9	Students are taught on the functions of each component of an automobile engine					
10	Students are sent for excursion or industrial visit to see different types of engine models in the industries.					
11	Practical lessons promote team work among students in technical college of education.					
12	In using engine models, the students identify the position of each components of the engine.					
13	The engine model allows the class members to share ideas equally from the same teaching experience.					
14	The use of engine models promote retention of learned skills and knowledge among students.					
15	Engine model helps the learners to develop the ability to think critically when used to teach them practical lessons in the class.					
16	When students are exposed to the basic use of automobile engine models they can teach automobile engines after graduations in post primary schools.					
17	The students find it costly to produce model in automobile workshop during practical class.					

18	Engine models provide opportunity for inquiry in teaching and learning of automobile technology when student are exposed to it.					
19	Engine model supplies avenues for further practical exercises in Automobile Technology					
20	Engine models help in visualizing class work by showing its application practically.					

SECTION II

To what extent do teachers use engine model to expose students to a wide range of automobile learning experiences

S/N	Item Statement	SA	A	UN	D	SD
21	Teaching using engine models increases peculiar efficiency by stimulating the condition for the learner to learn.					
22	The engine model provides teachers with the opportunity of exposing students to a wide range of learning experience.					
23	Engine model helps the teachers to provide their students with a meaningful and realistic source of information.					
24	Teachers are sent for refresher courses to update their knowledge on the use of new engine models in automobile technology.					
25	Engine model brings close experts and other learning resources to the classroom through workshops and seminars.					
26	Engine model helps to save time and energy of the teacher by limiting the use of wordy explanation					
27	The engine models provide correct specification of real objects in automobile technology.					

SECTION III

The adequacy of engine models for teaching and learning of automobile technology in College of Education.

S/N	Item Statement	SA	A	UD	D	SD
28	The number of engine models found in your school for students' practical in automobile workshop is adequate.					
29	The number of engine parts produced by students as a model during practical lessons in your college is adequate.					
30	The number of tools and equipment found for practical lessons in Automobile workshop for producing models of engines in your school is adequate.					
31	The functional parts of engine produced by students in your school are adequate.					

SECTION IV

The appropriate methods of teaching to be adopted in using engine model in automobile technology

S/N	Item Statements	SA	A	UN	D	SD
32	Engine models can be used by teachers for individualized learning.					
33	Engine models by demonstration helps the learner to develop creative thinking skills in automobile technology					
34	An effective method of teaching to be adopted using engine model is by grouping the students in the class.					
35	Teachers can use discovery method in teaching using models.					
36	Lecture method using engine models in teaching and learning of automobile technology helps students to acquire more knowledge and skills.					
37	Teaching large class size using engine models is the appropriate method to be adopted in automobile technology.					
38	Questioning techniques is one of the effective methods of teaching to be adopted using engine models in automobile technology.					