EVALUATION OF WORKSHOP FACILITIES FOR TEACHING MECHANICAL ENGINEERING TRADES IN TECHNICAL COLLEGES IN KADUNA STATE

BY

ANDREW, MANYA MAIGARI

JUNE, 2013.

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A PROJECT SUBMITTED TO THE DEPARTMENT OF TECHNOLOGY EDUCATION, SCHOOL OF TECHNOLOGY AND SCIENCE EDUCATION. MODIBBO ADAMA UNIVERSITY OF TECHNOLOGY YOLA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF INDUSTRIAL TECHNOLOGY EDUCATION.

JUNE, 2013.

DECLARATION

I hereby declare that this project was written by me and it is a record of my own research work. It has not been presented before in any previous application for a higher degree. All references cited have been duly acknowledged.

Name of candidate…. Andrew, Manya Maigari

Signature of

candidate……..

Date……..

DEDICATION

This research work is dedicated to my wife, Habiba M. Maigari, my mother Mrs. Magdalene Andrew, Kazahchat A. Maigari my son and my late brother Augustine Maigari

APPROVAL PAGE

This project entitled "Evaluation of workshop facilities for teaching mechanical engineering trades in technical colleges in Kaduna state" meets the regulations governing the awards of Masters of Industrial Technology Education of Modibbo Adama University of Technology, Yola and is approved for its contribution to knowledge.

_____	_____
Prof. V.V Apagu supervisor	Date
_____	_____
Internal Examiner	Date
_____	_____
External Examiner	Date
_____	_____
Prof. V.V Apagu HOD TE	Date

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Prof. M. R. Odekunle Date
Dean SPGS

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ABSTRACT

The study was carried out to evaluate the workshop facilities for teaching mechanical engineering trades in technical colleges in Kaduna State. Among the specific purposes of the study is to find out the availability of tools and equipment for effective teaching of workshop practical, to ascertain the adequacy of workshop facilities for the various mechanical engineering trade, to determine the safety measures employed by teachers in the use of workshop facilities, and to determine the practices adopted by administrators and teachers in the maintenance, storage and control of workshop tools and equipment. To accomplish the purposes of the study four research questions and three hypothesis were developed. A 45 – item structures questionnaire and 350 item observational check-list were used for data collection. It was developed based on the existing NBTE standard on technical college workshops and literatures on the subject matter, and was validated by four experts. Data was collected from 75 teachers and 300 students of Mechanical Engineering trades in five Technical Colleges in Kaduna state. Mean was employed to answer the research questions while t – test for the hypothesis using the statistical package for social science (SPSS) for analysis. Result revealed inadequacy of workshop facilities in technical colleges. Practices adopted by teachers in maintenance, storage and control of workshop tools and equipments are ineffective. It was therefore recommended that: the stakeholders should make adequate and appropriate provision of tools, equipment, machines and materials for the effective teaching of Mechanical Engineering trade courses in technical colleges was among the recommendations made.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Facilities and equipment are very important to any educational programme. When they are inadequate the programme suffers. (Okoro, 1991). The teacher can neither practice nor engage the learners in practical activities without the required tools and equipment. The presence of tools and equipment for practical experiences for the learner and the teachers are what make

the difference between technical education and other disciplines. The success of any instructional activities is a function of the availability of the necessary educational facilities. It is known facts that, there is no way a teacher will effectively teach practical aspect of a technical course, for instance turning operation in metalwork technology where there is no functional Lathe machine in the workshop. In agreement with this assertion, Puyate (2000), stated that, the availability and effective use of facilities for training or instruction in any Vocational College enhance the vital process of skills acquisition, which will in turn empower the beneficiary to be productive and contribute to national development. Evaluation of facilities and equipment should include not only deciding whether facilities and equipment are adequate but also how available resources could be used to achieve the best results.

Nwankwo (1982) asserts that the major problems with technical and vocational education in Nigeria were inadequate facilities. Educational facilities in Nigerian schools have been described as the neglected aspects of educational system. Adesina (1990) points out that although one potent index for evaluating standards and quality in education is the condition of educational facilities for learning, no other area had been so neglected by educational planners, during and after the colonial era like educational facilities.

Training facilities for Technical programmes encompasses all basic hand tools, equipment and structural facilities that help the learner properly. The term educational facilities, physical plant, and school plant, are used interchangeably in educational literature. Bulama (2001) asserts that they are used in reference to the structures (classrooms, workshops, laboratories and dormitories among others) furniture, equipment, and instructional materials, as well as other physical properties of the school. Vocational education programme requires tools and equipment that will help in the acquisition of occupational skills in the diverse trade. Ogbodo (1995) refers to educational specifications as statement that translate the physical requirements

of the education programme into functional facilities, describing clearly and concisely activities to accommodates in the school as their spatial requirements. Boyi (2008) maintains that one of the objectives of Vocational Technical Education is to develop saleable skills in the youth in order to make them useful to themselves, society and also become labour assets in the industries. The manifestation of these needed manpower and saleable skills only comes from institutions equipped with adequate facilities. As the technological development of any nation rests on the competence and capabilities of manpower, so also the capabilities and competence of manpower are hinged on adequate facilities in schools. In fact, the bedrock of manpower development lies within the workshop in school.

Workshop, according to Tomlinson (1984) is a place where people learn how to become skilled workers. There are two major types of school workshops: the specialized and general workshops. The workshops for the Mechanical Engineering craft trades are specialized workshops.

According to Puyate (2002), for any nation to develop technologically and industrially, such nation must have well trained and capable technical manpower that include technical teachers, craftsmen and engineers. The production of these skilled men and women is a function of educational facilities made available during their training in Technical Colleges and other institutions. Puyate, further stresses the importance of physical facilities such as workshops in technical training institutions as a venue for the provision and acquisition of technical skills. The acquisition of requisite skills in vocational technical education is a means of increasing the economic power of the individual concerned and that of the society as a whole.

In Nigerian society, the long process of preparing young people for life and work is centered on the educational system which comprises of Vocational and Technical Colleges. The National Policy on Education (NPE) viewed technical education as, that education which leads to

the acquisition of practical and applied skills as well as basic scientific knowledge for practical application in the world of works (Federal Republic of Nigeria (FRN,2004). The National policy on Education classifies technical education to include:

1. Pre-vocational education offered in Senior Secondary Schools.
2. Craftsmanship education offered at Technical Colleges.
3. Technical education as offered in Polytechnics and Colleges of Technology.

The policy document further states that Technical Colleges are responsible for craftsmanship training, and are also regarded as principal vocational institutions in Nigeria which give full vocational training intended to prepare students for entry into various occupations. In addition, the policy prescribes the following goals for technical and vocational education which include to:

(a) Provide trained manpower in the applied sciences, technology, and business, particularly at craft and technician levels.

(b) Provide technical knowledge and vocational skills necessary for agriculture, commercial and economic development.

(c) Give training and impart the necessary skills to individuals who shall be self reliant economically.

In pursuance of these goals, the policy statement maintained that the curriculum for each trade module shall consist of the following:

1. General education
2. Theory and related courses
3. Workshop Practice
4. Industrial training production work
5. Small business management and entrepreneurship

A critical look at vocational and technical education shows that the products of vocational and technical school programmes ought to posses two basic things namely: general education component and practical skills which are prerequisites for gainful employment or self-reliance. The present Vocational and Technical College products are not living up to expectation as Igwe (1993) observed that most of the products are half baked, unusable by users of the product and that most of the graduates of the Vocational Technical Colleges undergo another period of training before they are accepted as company workers.

In Kaduna State, daily experiences show that a good number of technical college leavers are roaming about in the streets without jobs because they did not acquire saleable skills while in school. As Olaitan (1996) points out the products of vocational technical schools are ineffective and unemployable.

Based on the aforementioned, it is therefore clear that the goals of technical and vocational education as stipulated in the National Policy on Education are not being achieved by the product of our Vocational and Technical Colleges since they do not acquire the desired practical skills necessary for gainful employment partly as a result of poor facilities. Agishi (2004), states that, facilities have a paramount role in teaching and learning workshop courses in vocational and technical education which can determine the employability of the products.

From the above background a study need to be carried out to Evaluate Workshop Facilities for Teaching Mechanical Engineering Trades in Technical Colleges in Kaduna state.

1.2 Statement of the Problem

The educational specifications for vocational technical education programmes vis-à-vis the objectives of these programmes provide for minimum requirements of facilities for these programmes to achieve their objectives. The poor conditions of educational facilities in vocational technical institutions have attracted attention and criticism from the educationists

among whom are Awotunde (1988), Mbata (1990) and Momoh (1995). The negative effects of this condition on the performances of the graduates of these educational programmes were highlighted. Ibe (1994) contends that poor educational facilities in vocational technical education programmes produce graduates that are half-baked and unemployable. Similarly, where equipment are not adequate or functional, vocational training programme will suffer and will lead to the production of highly unskilled personnel who are unemployable and unproductive.

The ultimate goal of all programmes offered in Technical Colleges in Nigeria is to produces efficient and relevant crafts men and women that will promote and hasten industrial development in the areas of maintenance, goods production, and general services. Unfortunately, these colleges appear not to be fulfilling their stated objectives (Olaitan, 1996). Commenting on the performance of technical colleges on skills development and workshop facilities, Gana (1989), states that the available workshop facilities have been grounded and overstretched. In another development, Enemali (1994) observes that technical colleges are haphazardly managed; they lack the capability to equip students with requisite skills, knowledge and attitudes needed for gainful employment. Offonah (1995) stresses that teachers do not seem to bother about the practical skills and facilities/equipment in the workshops to improve on practical skills, nor is the government listening to their cries over their difficulties in organizing practical lessons. For this reason students in Vocational and Technical Colleges are faced with problems such as inability to acquire the desired practical skills to be self-reliant and be gainfully employed. The problem in recent past has given room for hunger, unemployment, and general economic hardship for the citizens of Kaduna State. This situation must be corrected if vocational technical education programmes are to achieve their objectives. This problem of the study therefore was to Evaluate Workshop Facilities for Teaching Mechanical Engineering Trades in Technical Colleges in Kaduna State.

1.3 Purpose of the Study

The main purpose of this study is to evaluate workshop facilities for teaching mechanical engineering trades in technical colleges in Kaduna State. Specifically, the Study sought to:

1. Find out the availability of workshop facilities for teaching of workshop practical in Technical Colleges.
2. Ascertain the adequacy of tools and equipment for teaching various Mechanical Engineering Trades.
3. Determine the safety measures employed by teachers in the use of workshop facilities.
4. Determine the practices adopted by the administrators and teachers in the maintenance, storage and control of workshop tools and equipments.

1.4 Research Questions

The following research questions were formulated to guide the study;

1. What Workshop facilities are available for the teaching of mechanical engineering Trades in Technical Colleges?
2. How adequate are the tools and equipment for teaching of Mechanical Engineering trades?
3. What are the safety measures employed by teachers in the use of workshop facilities?
4. What are the practices adopted by the Administrators and teachers in the maintenance, storage and control of workshop tools and equipments?

1.5 Hypothesis

The following hypotheses were formulated to guide the study and were tested at 0.05 levels of significances:

Ho_1 There is no significant differences in the mean ratings of teachers and students on the adequacy of workshop tools and equipment for the effective teaching of mechanical engineering trades.

Ho_2 There is no significant difference in the mean ratings of teachers and students on the safety measures employed by teachers in the workshop.

Ho_3 There is no significant difference in the mean ratings of teachers and students on the practices adopted in the maintenance, storage and control of workshop tools and equipments.

1.6 Significance of the Study

The findings of this study will provide information on workshop facilities for teaching mechanical engineering trades in technical colleges, ministries of education, state governments, educators, Non Governmental Organization (NGOs) teachers and Parents.

The findings of this research will provide useful information concerning the state of school facilities to major stake holders such as government and policy makers, teachers and principals of both public and private schools. The findings of this study will enable the state government; have an update about the state of workshops and facilities used for teaching Mechanical Engineering Trades in their technical Colleges. Government will be able to use the results of the study to formulate viable policies for effective and enhanced technical education programmes in general, and mechanical Engineering trade programme in particular. The findings of this study will benefit technical Teachers in that, they will be able to assess methods in line with available facilities, safety and monitor the effectiveness of teaching and instructional materials. They will be able to select appropriate materials in line with instructional goals and as well improvise the materials where they are not available.

Parents can be sure that their children who graduate from Technical Colleges would obtain relevant and adequate skills to be self employed. The industries and other organizations

that are interested in updating skills of their personnel can make use of the finding to organize workshops and seminars to keep their staff knowledge updated.

The findings will also be of benefit to educators and the school administrators with relevant information on the practices adopted by teachers in the maintenance, storage and control of workshop tools and equipments. Donor agencies and financial institutions will see the relevance of providing facilities as a better alternative to factory/industry.

1.7 Assumption of the Study

In carrying out this study it was assumed that administrators and technical teachers posses enough information on mechanical engineering trades workshop facilities to serves as reliable respondents to the study.

1.8 Delimitation

The study is limited to only mechanical engineering trades courses (auto mechanic, general metal work; agric mechanization, welding fabrication and mechanical engineering) as stipulated in the curriculum of National Business and Technical Examination Board (NABTEB, 2004). Other areas such as Chemistry; Physics, Mathematics and Home Economics will not be included in the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter is discussed under the following sub headings:

2.1 Theoretical Framework

2.2 The Concept of Evaluation in Vocational and Technical Education

2.3 Models of Evaluation

2.4 Facilities and tools in Technical Colleges

2.5 Facilities Utilization and Programme Implementation in Technical Colleges

2.6 Storage and control of Materials, Equipment and Tools in Technical Colleges Workshops

2.7 Maintenance Culture and Concern of Safety in Technical Colleges

2.8 Review of Related Empirical Studies.

2.9 Summary of Related of Literature Reviewed.

2.1 Theoretical Framework

One of the theories that have a significant influence on teaching of vocational education is the one developed by Charles Prosser in the 1940s. Prosser developed sixteen most important theories or principles of vocational education. The first, second, third and seventh theorems are relevant to this work.

These are:

1. Vocational education will be efficient in proportion as the environment in which the learner is trained is a replica of the environment in which he must subsequently work.
2. Effective vocational training can only be given where the training jobs are carried out in the same way, with the same operations, the same tools and the same machines as in the occupation itself.
3. Vocational education will be effective in proportion as it trains the individuals directly and specifically in the thinking habits and the manipulative habits required in the occupation itself.
4. Vocational education will be effective in proportion as the instructor has had successful experience in the application of skills and knowledge to the operations and processes he undertake to teach.

Prosser's theorems emphasize that to complete the training of a student in skill that is saleable in an occupational life; part of the practice must be under production condition. This idea was supported by Okoro (1999) which says that vocational education will be effective in proportion

with the environment in which the learner is trained and also is a replica of the environment in which he must subsequently work.

An analysis of Charles Prosser's theory reveales that a quality programme for learning of vocational education employes the concept of theoretical knowledge in the use of tools, machines, equipments and materials of the occupation and using them safely, with good judgment, and pride in good workmanship. The vocational technical teachers are expected to be vast in the knowledge of what they teach the students as well as technically competent in manipulating the machines for the purpose of practical skills training. This will make the teacher effective in the process of teaching vocational / technical subjects in technical colleges.

2.2 **Concept of Evaluation in Vocational and Technical Education**

Evaluation according to Hughes (1959) , Grace (1994), Jedege (1999) and Jere (1999) is the process of ascertaining the worth or value of an object, event or individual. The decision or judgment is made possible as a result of the relevant data and analysis obtained. Okoro also noted that in view of appropriate evaluation the American research development effort "in skill Mastery as preparation" for effective vocational education, have brought about positive changes in the assessment of practical skills by Teachers. However, in Nigeria, it is unfortunate as Okoro noted that one of the problems associated with skill training is its evaluation. It has been observed by the author that a number of the technical teachers trained in Nigeria are unable to evaluate the level of skills possessed by their students. Whereas the ethical demand in their training is the development of their student skills. Accordingly, Okorie, and Ezeji (1988) Okoro (1991) Okoro (2000)) contended that technical teacher's pre-occupation should be to assist students acquire skills. Based on the above mentioned concepts, one cannot but agree with Aina's (1990) view that initial preparation of technical teachers is fundamental: if and only if

such teachers are to fulfill the necessary and accepted tasks in the methodology of inculcating knowledge, practical skills techniques in students.

Evaluation in Nigeria is done informally, as such results from such exercise are often not used to improve the programme, and the practice of evaluation in education has been grossly misunderstood. Consequently, evaluation has been taken to mean government approval of schools, supervision and inspection of schools, as well as accreditation of programmes. Okoro (2000).

To deal with the above inadequacies, Okoro (2000) suggests that government, school administrators and Teachers/Counselors must be committed and must adopt a number of measures. These measures include making evaluation to be broad based, placing more emphasis on evaluation of programme, planning, collecting and using evaluation data. Makama in Amasa (1999) highlights the following reasons for programme evaluation meeting the accreditation requirement. Accounting for funds, assisting the administration to make decision concerning the programme, answering the request from constituted authority, assisting in programme development for staff, and helping the administration to learn about the unintended outcomes. Hence by the time all purposes are put into proper perspective educational programme will be quite sound. As rightly observed by Amasa (1999) technical education programmes are quite expensive to install and operate. Evaluation comes handy in providing information for justification of funding such programmes. Decision makers need to be convinced on the value of a programme for them to approve the large sum of money required for the programme. Makama in Amasa (1999) also opines that evaluation will assist in determining whether the stated goals/objectives are been met, what aspect of the programme requires improvement, the content area of the curriculum that requires improvement, expansion or revision, the feeling of the

graduates over the completes programmes, manpower information for appropriate decision concerning the programme.

In the light of the foregoing, evaluation seeks to identify and enhance the adequacy of programme. Since the scope is wide it tends to cover all aspects of the programme. In management terms it means system approach to instruction. The system here covers facilities and equipments, instructional materials to ascertain availability, quality, utilization among other methods and other accessories that will ensure a thorough system over hauling.

2.3 Models of Evaluation

Okoro (2000), defines an evaluation model as a set of step or system of thinking which if followed or implemented will result in the improvement of educational programme. Johnson (1977) describes model as a mental picture or a conceptualization of the relationships assumed to exist among a set of phenomena. The study of evaluation models in technical education has become very necessary. According to Alkin and Eliet (1979), the understanding of an evaluation model gives insight and provides framework for undertaking of evaluation in a more defensible way. Alkin and Eliet added that further insights for practice are gained from the dynamics of model developments.

Olaitan (1996) remarks that the function of model is not only to identify the different parts of a whole but also to demonstrate how the parts interact and affect each other. A model may be communicated verbally, schematically, graphically or mathematically (Nwoke, 1986). It must however be pointed out that, a diagram for example, is not a model but only a visual representation of the model, which in turn is a mental picture of what is being modeled.

Okoro (2000) concedes that models serve as great help to programme evaluators because the models provide general guide and direction which can quite easily be modified to fit specific programmes being evaluated. Okoro further, warns that in selecting evaluation model for use, the

evaluator should consider (i) the appropriateness of the model, can it yield adequate information? (ii) The complexity of the model, can the evaluation model be effectively applied by the evaluator taking into consideration his experience, cost of implementation and other related factors. Hatch, (1983) observes that data for quantitative studies are often obtained from randomized experimental designs, quasi-experiments, paper and pencil test, sample surveys and the likes. Qualitative method, in contrast, utilizes subjective data obtained from case studies, participant observations, and interview and rating scale. Abdullahi, (2008) Outline some of the qualitative methods that have been employed in the evaluation of vocational education programmes to include:

The Illuminative Evaluation Model

Parleft and Hamilton (1976) develop the model and its primary concern was description and interpretation rather than measurement and prediction. The model approaches evaluation from the standpoint of understanding people and programmes in context without introducing external controls or manipulation.

The Goal-free Evaluation Model

This model developed by Scriven, in 1974 advocates that evaluators should enter into the evaluation process with prior knowledge of the goals of the programme, project or product being evaluated. The concern of the evaluator should be to determine the exact effects of the product of the project, and to evaluate whether or not the effects were intended. As qualitative methods, the model relies heavily on description and direct experience with the programme or project.

The Transaction Evaluation Model

The model concentrates on the actual educational processes themselves; the classroom, the school, the programme etc and was developed by Stake (1975). It is basically an action research approach in which people implementing programmes are helped to conduct their own

evaluation. The main weakness of this model is its lack of external credibility. Furthermore, the method is susceptible to bias on the part of the people in the local setting, since they in effect have great control over the evaluation study and its results.

The Discrepancy Model

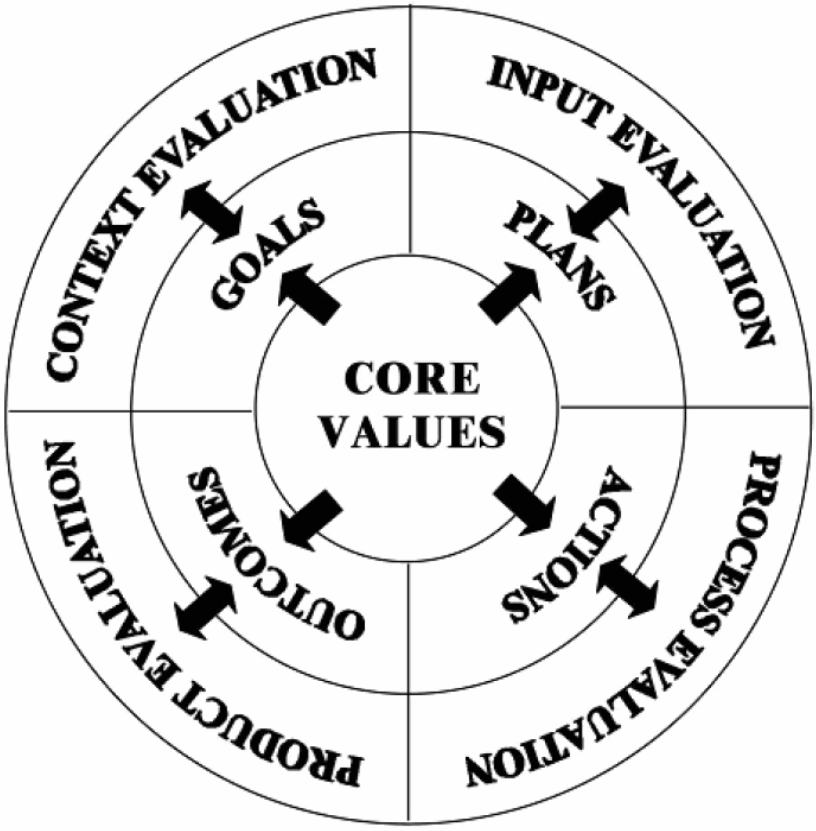
The discrepancy model of evaluation sees evaluation as the description of the discrepancy that may exist between expectation and existing conditions of a progamme. Provus, (1978) developed the model; the discrepancy can exist at any stage of the programme, e.g. design, implementation, production and cost.

The CIPP Evaluation Model

The Context, Input, Process, product (CIPP) model developed by stufflebeam (1974) sees evaluation as a process of delineating, obtaining and providing useful information for judging with regards to competing alternatives. The CIPP model is perhaps one of the most widely used in evaluating vocational technical education programmes. It identified four types of decisions and these are planning decision, structuring decisions, implementing decisions and recycling decisions.

Finch and Mc Gough in Okoro (2002) opine that evaluation effort is best built upon a conceptual framework. Thus, they view evaluation of vocational and technical education curricula and programme as being related to initiation, structuring and operation of the school system. Evaluation is then produced into four stages to include context evaluation, input evaluation, process evaluation, and product evaluation. These sub-components of this model can be evaluated, depending on the objectives, circumstances and situations surrounding the study. Ezeudu (2005) observed that context, input, process and product (CIPP) evaluation are the most useful element of evaluation framework. Figure 1 below explains CIPP evaluation model

Table 2.1: **CIPP Evaluation Model**



Source: David D Williams, (2001)

From figure above, context and input evaluation are most appropriate when initiation and structuring activities are to be conducted, while the process and product evaluation relate more closely to operation activities. Olaitan and Ali (1977); Okoro (2002) and Ezendu (2005) opine that the purpose of the four components: context, input, process and product of programme evaluation stages are as follows:

1. Context evaluation: explains the general conditions in which an action or event occurs. The vocational and technical education curriculum context describes the conditions under which the programme objective could be achieved. The conditions incorporate both favourable and unfavourable ones. The vocational technical education evaluation is therefore the process of describing the problems of vocational technical education programme in relation to the determination of programme objectives with a view to improving the programme.

2. Input evaluation: Input in vocational and technical education describes the resources put into the programme both human and material resources. Input evaluation seeks to provide data for determining the mechanism of utilizing the resources toward the realization of the programme objective. The focus of vocational technical education input evaluation is to identify the techniques for realizing the programme objectives and appraise the format for putting into functioning mechanism opted for.

3. Process evaluation: Process in vocational technical education is the series of operations deliberately undertaken or series of changes or actions in the implementation of the planned programmes. The process evaluation is meant to provide result of actions taken by those involved in the process of implementation of vocational technical education plans and procedures. The data provided form the basis of interpreting the programme outcomes.

4. Product evaluation: Vocational technical education product evaluation is the end result expected or anticipated based on stated objectives. Product evaluation is therefore intended to determine and interpret objectives attainment at the end of the programme period. This form of evaluation is focused at:

1. Providing information for taking decisions on whether to continue, do away with, modify or reject a possible change in the activity, and

2. Providing information for linking up activities to other processes of change.

The input evaluation procedures of Stufflebeam (1974) CIPP evaluation model will be applied in this study. This is because; the researcher is going to evaluate tools, equipment and workshop facilities in Science and Technical Colleges.

The review of evaluation models becomes necessary because model of evaluation provide the evaluators with the knowledge of how the parts interact with one another. Model of evaluation also provide evaluators with a systematic way of thinking which if implemented will

result in the generation of information which could be used by decision makers in the improvement of an educational scheme or programme.

2.4 Facilities in Technical Colleges

Educational facilities are the material things that facilitate teaching and learning in the college (Miller, 2006). These include College building teaching aids, equipment, machinery, furniture, electrical fixture and devices such as modern educational hardware and their software in the form of diskette, films and transparencies. These facilities are numerous, they are materials and services that help to facilitate teaching and learning in a school system .Miller, also states that educational facilities are the operational input of every instructional programme.

Vocational and technical education facilities as stated by Ezema (1996), can be describe as follows:

1. Building (e.g. workshop, laboratories, classrooms, dining halls, hostels and so on.)

   Equipment (e. g. projectors, typewriter, computers desks, machines and tools etc)

2. Space (e.g. garden, playground etc)

   Apparatus (e.g. caliper, burettes, pipettes etc

3. Castala, in Jen (2003) explained that educational facilities in our institutions include equipments, tools, learning/instructional materials, consumable materials and infrastructure (classrooms, assembly halls libraries and workshop). Thus:

   i. Tools, equipment and training materials.

   ii. Teaching and technical/administrative supportive staff.

   iii. Infrastructural facilities which include administrative blocks, health centre, workshop, laboratories, libraries.

   iv. Utility services such as water, electricity and communicational facilities (Yakubu, 2002).

Educational facilities for this study refer to all the physical resources as listed in the curriculum of the mechanical craft trades programme. The list include: workshop/ laboratories, tools and equipments and consumable materials.

Workshop, according to Tomlinson (1984) is a place where people learn how to become skilled workers. Tomlinson (1984) further stated that a workshop may just be a small unit employing a limited number of people or a very big concern employing quite a substantial number of people. Love (1999) views workshop as a building where manual work is carried out such as manufacturing and repairs. A standard Mechanical Engineering Trade school workshop will require a separate space divided into separate and distinct areas meant for welding, machinist and work benches.

According to Ezema (1996) there are two major types of school workshops: the specialized and general workshops. He further explains that a specialized workshop takes care of the needs of one type of trade or the order. The general workshop is designed to cater for more than one trade. The workshop for the mechanical engineering craft trades is a specialized workshop.

Spencer, in Ezema (1996) states that, the Mechanical Engineering Trade Workshop belongs to the medium category of workshops and has a desirable space requirements of $11m^2$ per student in addition, the national board for technical education (NBTE, 1992) criteria and standards for accrediting technical college programmes pointed out that Workshops for the Mechanical Trades (MT) shall provide the following:

1. Fitting bench work
2. Machining work place
3. Welding and fabrication
4. Auto electricity

5. Engine maintenance
6. Service station
7. Foundry section

The general standard for a school workshop as specified by the National Board for Technical Education (NBTE, 1992) criteria and standard for accrediting programmes in technical colleges are: workshop must be well ventilated and should be well laid out to facilitate its maximum use for production work.

The focus of the study is Evaluation of Workshop Facilities for teaching mechanical trade in Technical Colleges in Kaduna state, with a view to proving useful data that will aid in a meaningful decision making for improvement.

2.5 Facilities utilization and programme Implementation in Technical colleges.

The availability of physical facilities for the implementation of mechanical trade programmes is of crucial importance. However, several years ago many technical colleges were without the facilities (Ogunyemi (1999). Ngada (2001) and Garba (2003) showed that in some schools, there were no buildings to house equipment. In others, the buildings were there but tools and equipment were in short supply and workshops grossly ill maintained. Therefore, in order to ascertain whether the situation has improved today, an evaluation exercise is required. Dogo (1997), Adegun (2001) argue that the dearth of tools, equipment and other forms of instructional materials in our Technical Colleges is traced back to neglect.

Oguntiase (1997) said that Nigerian people have a lukemarm attitude towards government property. This nonchalant attitude to public infrastructure, according to Isa (2003) has driven Nigerians to indulge in idleness and wasteful celebrations instead of investing in education. Dalha (1996), reports that the attitude of Nigerians to government property has led certain schools to leave essential technical equipment to waste away in containers. And that

sometimes the tools and equipment which awaited installation suddenly disappeared from the premises of schools. The outcome is that many schools in Nigeria continue to experience the dearth of tools and equipment in workshops. Ultimately, programms implementation in TVE faces a severe threat.

Ajayi (2009), maintained that the planning of workshops in some secondary schools seem defective. He emphasized that apart from the fact that some schools use classrooms as ad-hoc workshops, in some cases workshop are located very close to classroom, not spacious and lack adequate facilities, cross ventilation and lighting.

Practical lesson are in evitable for must skills training programs. That is why Eule (2000) argues that student's practical work in school workshop and laboratories demands that the following conditions be met, among others:

1. Adequate consumable materials
2. Functional machines and accessories
3. Adequate manpower to man the machines
4. Adequate power supply to the workshop
5. Adequate hands tools.

In some schools in Nigeria however, students lose time in the workshop and are therefore, unable to cover the syllabus that treats the practical aspect of their course (Abubakar, 2000). Obafemi citing in Ezeji (1998) attributes the development to lack of proper planning and arrangement of equipment and materials and the mal-functioning of available equipment and machinery. Obafemi (1999) added that sometime they are under-utilized.

Ogbueguna cited in Onyejemezi (1981) states that the non-use or under utilization of available facilities in our schools is attributable to the teachers. Ogbuegbuna further explains that resource material in education do not on their own achieve any meaningful values. Their

importance depends on what the teacher is able to make of them. Ogbuna (1998) stresses that "one of the reasons why available materials are not used by many teachers in schools is that they lack the necessary skills to operate them" (60).

2.6 Storage and Control of Materials, Equipment and tools in Technical Colleges Workshops

In every occupation, laboratory, tools and equipment needed to provide various skills should be made available. According to Olaitan (1999) they should be in constant use by both staff and learners and should be kept in good condition and control.

Olaitan further pointed out the following principles:

1. Equipments and tools should be organized in sequence like users, size, colour for ease of reference and continuity.
2. Proximity to users should be of top priority; this will afford free access to them.
3. Damage tools need to be replaced for continuity of the progammes.
4. Tools should be organized and arranged so that supervisors can inspect and identify immediately worn out, broken and lost ones.
5. Hazardous substances subject to abuse must not only be stored securely but also be kept under control.
6. Careless loss of tools and material must be constantly checked.
7. Waste must be minimized.

From the aforementioned principles, it is desirable to make vocational and technical college laboratory similar to occupational standard and to actual industrial setting. This will prepare learners for various occupations and minimize the adjustment needed to enter into industries or world of work. Items in the school workshop are usually prone to waste, damage and losses because of the inexperienced hands that handle them. To curtail these to a minimum, vocational

and technical education student must be acquainted with adequate storage and control of materials, tools and equipment in every workshop (Ezema, 1996). Ezema identifies six major ways of storing tools in school shops:

1. *The Tools crib/Room:* The tool crib or tool room is an enclosure where all tools used in workshops are centrally kept. A tool crib should have its upper boards enclosed with thick gauge wire meshes. The lower part is built up with cement or wood as the case may be. With such design, good lighting and ventilation is assured in crib, and activities in the crib can be supervised.

   According to Ezema (1996) Shelves and racks are constructed on the built up part of the cribs. Then he further, opines that a tool crib should be as centrally located as possible and where it serves more than one laboratory it should be provided with two doors, each leading into the work area it serves. This makes for easy accessibility for those using it.

   The management of tools in a crib is similar to those of other storage facilities. Heavier tools are stored on shelves that are as close to the floor as possible. The lighter ones occupy the upper part of the facility. This arrangement minimizes the chances of heavier tools falling on lighter ones or on the tools of the crib attendant.

2. *The Tool Cabinet:* Tool cabinet is designed in such a way that it can be opened when in use and closed when not in use. He further states that special facilities to hold different types of tools are built into it, nails, hooks and various sizes of holes are common sight.

3. *The Open Panel:* This is popular in general workshop. The cabinets are left open and each activity in the workshop has a panel attached to it. Users are expected to collect tools from the panel and return them after use. This mode of tools storage has the problem of poor tool control.

4. *The Movable Rack:* Where heavy-duty tools are needed for some special jobs, collecting them from a central storage facility will be very inconveniencing. In such situation, the tools are mounted on moveable racks and placed on racks located very close to the lathes.
5. *Bench Tools Storage:* This is a type of tools storage commonly used in wood shops. Tools are temporary stored on special provisions on top of workbench (the well), when the benches are in use. The other type, which is of a more permanent nature, is the storage of tools in drawers built into the work benches.
6. *Dispensation of Tools in Tool Crib:* The most common method used in workshop as well as in many industries is the method whereby an attendant lists the tool borrowed by students and asks the borrower to sign for them before collection.

   Ezema further states that, when the tools are returned, the attendant countersign and receives them from the students. The other method may be the hanging of identification number of the student who borrowed the tools, in the position the tool was occupying before it was removed. There may be the need to cut silhouettes or dotted outline of tools borrowed when carrying out a check.

In the storing material for school laboratory; Abbas (1990) states the following considerations:

1. *Popularity:* Items which are more required should be placed close to the items desk with those that are popular in a central store.
2. *Similarities:* Materials which are similar in nature and application are therefore likely to be packed on the same order. This grouping together of items would help to reduce the time taken in a particular requisition.

3. *Size:* The size of the storage rack should relate to the volume of the particular items to be stored. The size of the individual items and the space taken up or occupied by the group of items should be considered in storing materials for a school laboratory.
4. *Characteristics:* The compatibility in the various items in close proximity to each other is very essential to reduce time taken on requisition. The main storage for flammable materials should be in separate building far away from the main working area of the laboratory.

2.7. Maintenance Culture and Concern of safety in Technical Colleges

According to Olaitan (1999) maintenance is defines as taking specific approved steps and precautions to care for a piece of equipment, machinery or facility and ensure that it attains its specific maximum functional life. Ezema (1996) also describes maintenance as the activities performed on plant, machinery equipment, tools and other items, to keep them in good working condition, thereby extending their functional lives. Based on the above definitions, maintenance generally means the totality of measures employed to ensure that a given piece of capital asset, equipment or infrastructure is kept in good operational order until attained its maximum span.

According to Usman (1984), there are basic reasons for keeping tools and equipment in a first class condition:

1. To promote a high degree of efficiency
2. To maintain safe working conditions; and
3. To keep cost operation and prolong the life span of equipment.

Usman further states that when a student realized that he cannot undertake a good work because of poor equipment, he soon develops a negative attitude toward his work. Also, student who dislikes practical work in the shop will not put in any effort to share in the responsibility for its upkeep. When such conditions prevail discouraged students have been known to deliberately

abuse the tools and equipment. The efficiency of the shop and the attitude of students grow progressively worse under such conditions. Dull tools and broken equipment are part of the major causes of accidents in the laboratory, so every effort must be made by the technical and vocational teachers to maintain safe working condition in the shop (Dabban and Abbas, 2000).

According to Abbas (1998) the teachers needed to provide well organized and complete safety instruction with periodic inspections to determine that the safety precautions that are observed to work in. Winter (1980) observes that in the maintenance of shops one of the most important phase is that of maintaining the safety devices on machines and their immediate adjustments or repair when found to be not of order. Gana (1992), states that aged tools, such as chisel and knives are safest to handle when sharp than when dull, while sharp plane, are dangerous when dull than when properly sharpened. All tools need constant sharpening. In school shop were tool s are always sharp and in good working condition, where machines are adequately guarded, where projects and materials are properly stored, where broken and won parts are immediately replaced, there will be so sound and wholesome students attitude towards practices that prevent injuries.

When a teacher, is not a good housekeeper and fail to keep the equipment and tools in good working condition at all times, there is excessive breakage, and the equipment wears out before it exhausts its normal life span in school situation. This results in spending huge amount of money to replace tools and equipment and reduces the funds available for instructional material (Udo, 1993). The proper care of tools and equipment reduces operational costs and encourages the school administrators to purchase equipment for the expansion of the programme.

Dabban and Abbas (2000), states that periodic oiling or greasing of machines reduces the wear of moving parts and prolongs the life of equipment. It is therefore important to organize

the maintenance activities by College Administrators so that students will be involved in the proper servicing of such equipment at the designated time. It is important to lubricate machine at regular intervals as it is necessary to have an automobile lubricated after moving every thousand mile.

2.8 Review of Related Empirical Studies.

This part of the literature review takes into consideration research studies that have been carried out previously and their findings as they relate directly or remotely to the current study.

Kalegha (2008), carried out a study on problems of practical skills acquisition among Building trades students in Vocational and Technical Colleges. The purpose was to find out how students acquired practical skills in building trade. Three research questions were used to answer these questions with the population of 261 from Vocational Centres and Technical Colleges. The method of data collection was questionnaire and the mean, standard deviation and t-test were used for data analysis and testing of hypothesis respectively. The findings of the study were:-

i There are no adequate number of tools and equipment in the building workshops.

ii Teachers do not take their students on field trips and excursions.

iii There are no adequate numbers of workshop personnel in the building workshops to assist students during practical work.

Finally he recommended that the stakeholders should make adequate and appropriate provision of tools equipment and materials for the effective teaching in vocational and technical Colleges.

Idris (2006), conducted a research on the Assessment of constraints affecting effective school workshop management in tertiary institutions in Osun and Ondo states. A survey research design was adopted for the study. The instrument used to collect data was questionnaire developed by the researcher. The Cronbach Alpha formula was used and reliability coefficient of 0.83 was obtained for the questionnaire. The main population for the study comprised the

lecturers, instructors and workshop attendants in Technical Colleges, Colleges of Education, Polytechnics and University of technology in Osun and Ondo states.

210 copies of questionnaire were randomly sent out to respondents in seven institutions, out of which 184 copies were completed, returned and used for the study. Data collected was analysed using the frequency and mean statistics. The findings of the study reveal that most of the management principles needed for the Effective School Workshop were not provided. It is also evident from this study that insufficient fund for both practical activites and workshop maintenance constitute major constraints to effective management of workshops. Control which is one of the functions of management was also given less priority in the management of workshops in tertiary institutions. Among major recommendations was that:

Regular budget planning of equipment, materials and tools with regards the number and level of students should be emphasized at the beginning of each session. Training and re-training of workshop personnel should be vigorously pursued. For effective quality control, material handling systems should be designed and installed in institutional workshops.

Ijidakinro (1990) carried out a study on identification of skills needed by secondary students in agriculture towards self employment in Ondo State. A total of 55 items were structured in the questionnaire and a total population of 166 teachers of agriculture and 51 agriculture supervisors in various agriculture industries in the state. Data collected were analyzed using mean and t-test. Findings showed that all 55 skills identified for the study were needed by the secondary school agricultural science students for self employment. The study also revealed that the inability of graduates of secondary school agricultural science programmes to put the knowledge they acquired from subject into practical use on actual job situation resulted from the inadequacy of the scope of practical work in the school. This led them to queue for jobs with other graduates of non-vocational courses. The findings also revealed four major areas of

Agricultural Science in which the students needed to be skilled. Agriculture, soil and water conservation and management, crops and animal husbandry. That, skills in these areas were not effectively taught by Agricultural Science teachers to enable students become competent in them. Therefore, it was recommended that all these neglected areas should be thought effectively to the students.

Akinseinde's (1998) work on strategies for improving the teaching of technology in secondary schools used the survey research design. His findings show that there is lack of adequate tools and materials for the teaching of technology subjects and poor teacher's participation in workshops, seminars and conferences. He recommended that teachers should teach students to acquire skills on use of tools and materials and look for new ideas on technology as a result of societal changes. He equally recommended that technology teachers should be given the support and opportunity to use facilities and tools needed to teach technology, and workshop should be organized for technology teachers since technology subjects leads to skills acquisition and are been offered in vocational technical colleges.

In a study conducted by Onuoha (2000) to find out the factors that militate against the maintenance of facilities in the Institute of Management and Technology (IMT), Enugu, Metal Work Workshop, 68 respondents were involved in the study. Questionnaire items were used and data collected were analyzed using frequency tables, means and Pearson product moment correlation coefficient. The findings of the study revealed among other things that lack of planned maintenance policy, funds and spare parts seriously affected maintenance of facilities in the workshops. Among the major recommendation was that:

i. Government and the administration of the institutions should make available adequate workshop facilities for effective teaching and learning.

ii. That funds should be provided for the maintenance of the available facilities and

iii. In-service training and frequent workshops should continue to be approved for the personnel in the maintenance department.

Similarly, another research work was conducted by Gibson (2002) to determine appropriate maintenance practices for the improvement of management of laboratories and workshops facilities in Nigerian Polytechnics. In the study, the researcher expressed a belief that applying appropriate maintenance care of practice will reduce the deterioration and hence prolong the working life of tools, equipment and machines. He went further to point out that workshops/laboratories are established to provide practical support for the professional courses taught. As such, the operation of the workshop/laboratory should be done according to established accepted standard.

The population of the study consisted of 44 respondents from Taraba State Polytechnic, Jalingo. It was made up to 23 lecturers and 21 maintenance officers. Structured questionnaire items were employed to elicit information to answer the research question. The data collected was analyzed using descriptive and inferential statistical techniques.

The finding of the study revealed that there were inadequate facilities for effective teaching and learning. It also revealed that the available tools and equipment in the workshop are obsolete and worthy of mention was that most of the personnel in the maintenance are not technically qualified for effective management and maintenance of workshop and laboratory facilities.

2.9 Summary of Related Literature Review

The literature review showed the pitiable condition of school workshops. School workshops are usually equipped with machines, equipment and other facilities to enhance skills acquisition of students of technology hence the need to evaluate the workshops facilities for

teaching mechanical engineering trades in technical colleges in Kaduna state is very imperative.. And this can only be achieves, where there is adequate workshop facilities.

The theoretical framework under the study was based on Charle's theory. This is because the theory specified the minimum standard for learning skills in Vocational and Technical Education. The theory was found to have direct link with needs of teachers and students for practical exercises in vocational technical education workshops.

Finch and Mc Cough in Okoro (2002) opined that evaluation effort is based or built upon a conceptual framework. Thus they view evaluation of vocational and technical education curricula programmes and services as being related to initiation, structuring and operation of the school system. Ezeudu (2005) observed that context, input, process and product (CIPP) evaluation are the most appropriate evaluation model for studies like the current study.

From the literature reviewed Olaitan (1999) says that for technical education to be functional the need for well trained technical teachers is very crucial and this is done to expose teachers to acquire manipulative skills in their chosen occupation. Ogunsaju (1990) also stresses the need for adequately qualified technical teachers to be employed to teach effectively in technical schools.

To search for knowledge the empirical study review four different literatures that are related under this study. The researcher considered the purpose of the study, the finding and the methods of these four literatures which were undertaken by Agu (1993) in his study of the adequacy of the theory of practical ratio of technical college curriculum for employability of its graduates; Ijidakinro (1990) carried out a study on identification of skills needed by secondary students in agriculture towards self employment in Ondo State. Onuoha (2000), carried out a study to find out the factors that militate against the maintenance of facilities in the Institute of Management and Technology (IMT), Enugu, Metal Work Workshop. He found out that lack of

planned maintenance policy, funds and spare parts affect the maintenance of facilities in the workshops. Akinseinde (1998), carried out a study on strategies for improving the teaching of technology in secondary schools. His findings show that there is lack of adequate tools and materials for teaching of technology subjects. Gibson (2002), study was to determine appropriate maintenance practices for the improvement of management of laboratories and workshops facilities in Nigerian polytechnics.

Though the researchers above wrote extensively on adequacy of practical skills, maintenance of facilities and the strategies of teaching technical courses; inspite of this study student performance seems deteriorating. It is probable that the workshop facilities adopted by the teachers for these teaching of mechanical engineering trades in technical colleges in Kaduna State may be responsible for these, hence the need for this study.

CHAPTER THREE

METHODOLOGY

This chapter describes: Research Design, Area of the Study, Population of the Study, Sample and Sampling Techniques, Instruments for Data collection, Validation of the Instrument, Reliability of the Instrument, Method of Data Collection and Method of Data Analysis.

3.1 Research Design

This study adopts evaluative research design to evaluate the adequacy of workshop facilities in technical colleges in Kaduna state. Best (1981) describes evaluative studies as involving gathering data to be used as a basis for judging the effectiveness of such issues as, the instructional facilities, curriculum, teaching and supervisory personnel and financial resources in

terms of best practices and standards in education. Similarly, Hadley and Mitchell (1995) opine that evaluation design is an applied research carried out to make or support decisions regarding one or more service programme. The evaluative design is considered suitable and appropriate because the study is concerned with gathering of data to be used as a basis for passing a value judgment on the programme being evaluated.

3.2 Area of the Study

The study covered all technical colleges in Kaduna State. These are; Government Technical College Kajuru, Government technical College, Fadachawai, Federal Technical College Kafanchan, Government Technical College, Abet, Government Technical College Malali and Government Technical College, Soba.

Kaduna State is currently made up of 23 local Government Areas and lies between latitude 9^{o}N and 12^{o}N and longitude 6^{o}E of the prime meridian. It borders between Federal Capital Territory on the south and six other states, namely, Katsina, Kano, Nasarawa, Plateau, Niger, Zamfara states. The state is located in the Guinea Savannah ecological zone of the country.

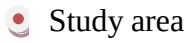


Fig 3.1: Map of Kaduna State showing the study area

3.3 Population of the Study

The targeted population for this study consisted of 380 respondents, comprising of 80 teachers and 300 mechanical engineering trades student. Due to the relatively small size of the population for the study, no sampling was carried out, hence the entire population was used for the study.

Table 3.1: Distribution of population of Mechanical trades teachers and students in the six (6) Technical colleges in Kaduna State.

S/NO	TECHNICAL COLLEGES	NO. OF STUDENTS	NO. OF TEACHERS
1.	Govt. Tech. College, Kajuru	56	10
2.	Govt. Tech.College, F/ Chawai	44	12
3.	Fed.Tech.College Kafanchan	52	15
4.	Govt. Tech. College, Abet	48	16
5.	Govt. Tech. College, Malali	76	20
6.	Govt. Tech. College, Soba	54	17

Source: Ministry of Science and Technology, Kaduna State (2009)

3.5 Instrument for Data Collection

The instrument used to collect data was a structured questionnaire developed by researcher. It is known as evaluation of workshop facilities questionnaire (EWFQ). A 45 –Item structured questionnaire and 362 checklist items were used for the data collection. It was developed based on the existing NBTE standard on technical college workshops and literatures on the subject matter. The questionnaire was divided into (4) sections; A-D, Section A require personal information about the respondents while section B-D requires information on the four research questions, that is the safety measures, adequacy of tools and equipment, the maintenance of tools respectively. The items in section B-D are structured in a five point likert scale. Each section (B-D) contains 30 items. The response categories and their assigned numerical values and meaning are as follows:

Strongly Agree	(SA)	……. 5
Agree	(A)	……. 4
Undecided	(UD)	……. 3
Disagree	(D)	……. 2
Strongly Disagree	(SD)	……. 1

3.6 Validation of the Instrument

The questionnaire for this study was subjected to face validity. The drafted questionnaire was given to four experts in the department of Vocational and Technical Education in Modibbo Adama University of Technology Yola, Adamawa State. They were requested to study the items for clarity, relevance and suitability for the study.

The face validation focuses on the item arrangement and logical sequence of the questionnaire item to ensure that each of the item in the instrument adequately addresses the

research question and the purpose of the study. Face validity refers to the degree at which the items on a measurement instrument appears relevant to what is being measured (Mertons, 1998).

3.7 Reliability of the Instrument

To determine the reliability of the instrument for this study, a final drafted copy of the questionnaire was administered to 10 students and two teachers selected from two Technical Colleges in Kano State. The information collected was analyzed using split-half technique. The result of the two halves was co-correlated using the Spearman Rank order co-correlation coefficient formula.

3.8 Method of Data collection

Data used in this study was gathered through structured questionnaire and a check-list. The questionnaire was administered to technical teachers and students by the researcher with a research assistant. The questionnaire was administered and collected after the respondents have finished filling them.

Table 3.2: Showing distribution and return rate of questionnaire for students from each of the technical collages in Kaduna State.

S/NO	TECHNICAL COLLEGES	DISTRIBUTION	RETURN RATE	PERCENTAGE%
1.	Govt. Tech. College, Kajuru	56	51	91
2.	Govt. Tech.College, F/ Chawai	44	39	88.8
3.	Fed.Tech.College Kafanchan	52	47	90.4
4.	Govt. Tech. College, Abet	48	43	89.6
5.	Govt. Tech. College, Malali	76	71	93.4
6.	Govt. Tech. College, Soba	54	49	90.7
	Total	**330**	**300**	**90.9**

80 questionnaires were distributed to the teacher of the six technical colleges, and the return rate was 100 percent.

3.9 Method of Data Analysis

The data collected was analyzed using the means and standard deviation, while the three hypothesis were tested using the t- test at 0.05 level of level of significance. The mean ratings of 3.50 and above were considered as agreed, while items rated below 3.5 were considered disagreed. Hypothesis whose calculated t- value is greater than the table t- value was rejected, but if the calculated t- value of the hypothesis is less than the table t- value, the null hypothesis was accepted or upheld at 0.05 level of significance and relevant degree of freedom.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter presents the results of data analysis based on the research questions and the hypothesis that guide this study and discusses the findings

4.1 Research Question 1

What are the Workshop Facilities available for the Teaching of Mechanical Engineering Trades in Technical Colleges?

Table 3: A checklist for Determining Availability of Facilities for Welding and Fabrication

S/No	Tool	Minimum Quantity Required	Quantity Available	Remarks

1	Power guillotine of capacity 10 swg x 36 in length	2	2	Available
2	Treadle guillotine of capacity 20 swg x 36 in length	2	0	Not available
3	Swing beam folder 10 swg x36" capacity	2	0	Not available
4	Bending roller capacity 40" x2" diameter	2	0	Not available
5	Bending roller capacity 18 x L5" diameter	2	0	Not available
6	Bench mounted cone roller	5	0	Not available
7	Hand operated copper capacity 3/32" in mild steel	5	0	Not available
8	Power bench grinding machine	2	0	Not available
9	Double ended buffer and polisher	2	0	Not available
10	Universal beading and swaging machine	2	0	Not available
11	Power-operated drilling machine maximum capacity 3/8"	2	2	Available
12	Wheeling machine	2	0	Not available
13	Fly press	1	0	Not available
14	Hand nibbling machine	2	0	Not available
15	Left & Right hand snip	5 each	20	Adequately Ava.
16	Straight snips	5	10	Adequately Ava.
17	A Kit" of tools consisting of hammer, mallet, steel, rule, scriber and wing compass, etc	5	0	Not available
18	Bench shears	2	2	Available
19	Power saw cutting machine 10mm	1	0	Not available
20	Disc cutting machine	2	0	Not available
21	Profile cutting machine with gas cutting nozzles	2	0	Not available
22	Pillar drilling machine	2	0	Not available
23	Louver shearing machine (manual)	2	0	Not available
24	Overhead crane	2	0	Not available
25	Straightening machine	1	0	Not available
26	Cropping machine	2	0	Not available
27	Straight edge	2	10	Adequately Ava.
28	Trammels dividers (set)	10	0	Not available
29	Hammers	10	8	Not available
30	Chisels	10	5	Not available
31	Punches	10	8	Not available
32	Try-square	10	20	Adequately Ava.
33	Steel rules	10	22	Adequately Ava.
34	Smith open forge	10	1	Not available
35	Vee Blocks	2	0	Not available
36	Electrode holders	10	2	Not available
37	Electrode Drying oven	10	0	Not available
38	Heavy duty grinding machine	2	0	Available
39	Bench-type grinding machine	2	2	Available
40	CO_2 cylinders	2	0	Not available
41	Transformers with rectifiers (with all attachments)	5	2	Not available
42	Aprons (Assorted)	10	8	Not available
43	Hand gloves	20	8	Not available
44	Hand shields heir caps	20	0	Not available

45	Wire brushes	10	4	Not available
46	Electrical heaters	10	0	Not available
47	Pliers	2	5	Not available
48	Gas welding goggles	10	5	Not available
49	Double cylinder trolley	5	4	Not available
50	Oxygen regulators	2	1	Not available
51	Acetylene regulators	5	1	Not available
52	Hoses, clips and all attachments (sets)	5	0	Not available
53	Blowpipes (low and high pressured)	5	0	Not available
54	Tongs	5	4	Not available
55	Combined set of cutting & welding outfit	5	0	Not available
56	Power operated profile cutter with turntable	5	0	Not available
57	D.C. generator with all connections	2	2	Not available
58	A/C transformer (Argon) with all the connections	5	0	Not available
59	Argon cylinder	5	0	Not available
60	Regulators with flow meters	5	10	Adequately Ava.
61	Hacksaws and blades	5	20	Adequately Ava.
62	Water to carbide generators	10	4	Not Available
63	Carbide to water generators	4	0	Not Available
64	Overhead projector	4	0	Not Available
65	Computer set	1	0	Not Available
66	Anvil	2	4	Not available
67	Swage blocks	2	2	Not available
68	Chipping hammers	20	15	Not available
69	Plain goggles	20	10	Not available
70	First and boxes	2	0	Not Available
71	Sledge hammers	2	3	Available
72	G. Clamp-assorted	20	12	Not available
73	Self grip pliers-assorted	6	8	Adequately Ava.
74	Flatters	3	1	Not available
75	tic Clamps	6	2	Not available
76	Mole grips	6	1	Not available
77	Arc Welding Booths	8	1	Not available
78	Gas Welding Booths	4	-	Not available

The result in table 2 portrayed that items 1, 11, 15, 16, 18, 27, 32, 33, 38, 39, 60, 61, 71 and 73 were satisfactory workshop facilities for welding and fabrication. Similarly, all the remaining items constituting workshop facilities were unsatisfactory or completely not available.

Table 4: A checklist for Determining Adequacy of Facilities for Mechanical Engineering Craft Practice.

S/No	Tools	Minimum Quantity	Quantity Available	Remarks

		Required		
	FITTING			
79	Vices 150mm	22	24	Available
80	Benches	6	25	Adequately Ava.
81	Hacksaws	20	40	Adequately Ava.
	FILES	22	40	Adequately Ava.
82	250mm flat rough	22	40	Adequately Ava.
83	10” hand rough	22	10	Inadequate
84	10” round rough	22	8	Inadequate
85	10” three rough	22	7	Inadequate
86	10” square rough	22	20	Inadequate
87	10” half round 2nd cut	22	0	Not Available
88	200mm warding file	22	0	Not Available
89	100” retail file	22	0	Not Available
90	Wallets of warding files	22	0	Not Available
91	Steel rules (12”) 300m	20	40	Adequately Ava.
92	Tape rule 3000mm	20	10	Inadequate
93	Dividers	10	10	Inadequate
94	Scribers	10	20	Adequately Ava.
95	Pocket size (200mm) vernier	10	20	Adequately Ava.
96	Calipers	10	20	Adequately Ava.
97	Centre punches	10	10	Adequately Ava.
98	(1/2 1b) hammer 3/4 kg	5	10	Adequately Ava.
99	(11/21ib) hammer 3/4kg	5	10	Adequately Ava.
100	Oil can	5	20	Adequately Ava.
101	Pair of pliers 150mm	20	10	Inadequate
102	Tool box & lock odd-leg calipers	10	15	Adequately Ava.
103	Odd-leg calipers	20	10	Inadequate
104	Engineers squares 100	5	10	Adequately Ava
105	Screw drivers 200mm	5	30	Adequately Ava
106	Pair of tin slip nippy vice	5	5	Adequately Ava
	Fitting — Workshop Equipment			
107	Drilling machines sensitive	4	2	Inadequate
108	Drilling machines pillar	4	2	Inadequate
109	Drilling machines Radial	4	2	Inadequate
110	Surface table 12000 x 12000mm (4’x4’)	2	8	Adequately Ava
111	Surface plates 500 x500mm (18”xl8”)	2	10	Adequately Ava
112	Surface Gauge	2	5	Adequately Ava
113	Vernier Height Gauges	2	10	Adequately Ava
114	Vee blocks 100 x 100mm pairs	4	5	Adequately Ava
115	Vee blocks 200mm	4	5	Adequately Ava
116	Parallels strips (pairs) 37 x 25x300	4	5	Adequately Ava
117	Flat scrapers	4	5	Adequately Ava
118	Half round scrapers	4	4	Adequately Ava
119	Triangular scrapers	4	4	Adequately Ava
120	Metric sets 3mm-12mm	5	5	Adequately Ava

	(BA) 150 sets 0-10			
121	Sockets spanners 3-22mm	5	5	Adequately Ava
122	Open ended 3-22mm ‘spanner)	5	5	Adequately Ava
123	Pedestal grinders	2	2	Adequately Ava
124	Reamers 3-25mm	3 set	3	Adequately Ava
125	Reamers machine 3.25mm	3	1	Inadequate
126	Dial gauge	3	5	Adequately Ava
127	Chisels	10 each	20	Adequately Ava
128	Drills	5 each	20	Adequately Ava
129	Straight shank 11/2-10mm	5	20	Adequately Ava
130	Straight shank 6 - 15mm	5	20	Adequately Ava
131	Taper shank 3-22mm	5	20	Adequately Ava
132	Drift	2	2	Adequately Ava.
133	Heat treatment furnace (medium. size)	3	2	Inadequate
134	Micrometer 0-25	3	2	Inadequate
134	25-50	3	2	Inadequate
135	50-75	3	2	Inadequate
136	75-100	3	2	Inadequate
137	100- 125	3	3	Adequately Ava.
138	125-150	3	0	Not Available
139	Protractors	3	3	Adequately Ava
140	Bevel	3	10	Adequately Ava
141	Combination sets	3	10	Adequately Ava
142	Vernier	3	20	Adequately Ava
143	Optical	3	1	Inadequate
144	Limit Gauge	2	10	Adequately Ava
145	Telescopic gauges	2	5	Adequately Ava
146	Plug gauges	2	5	Adequately Ava
147	Slip gauges (set)	2	15	Adequately Ava
148	Feeler 05-64	2	20	Adequately Ava
149	Engineers squares 150mm	2	10	Adequately Ava
150	Caliper	2	20	Adequately Ava
151	Screw pitch gauges	2	3	Adequately Ava
152	Blacksmith forge (gas)	2	1	Inadequate
153	Blacksmith tools	2	4	Adequately Ava
154	Anvil, hammers, chisels fuller, shape	2 each	2	Adequately Ava
155	Block, pinches and drifts	2	4	Adequately Ava
156	Tongues of different types	2 each	5	Adequately Ava
157	Arboy press	2 each	2	Adequately Ava
158	Extractors	2	1	Not Available
159	Snips (tin sheat) 200mm	2	10	Adequately Ava.
160	Stud extractors	2	0	Not Available
161	Circlip plier (internal & external)	2	3	Adequately Ava.
162	Pipe wrench 250mm	2	5	Adequately Ava.
163	Pipe wrench 250mm	2	5	Adequately Ava.
164	Self grip wrench of mole grip	1	5	Adequately Ava.
165	Pipe sender	1	3	Adequately Ava.
166	Gullotine machine	5	1	Inadequate

167	G. clamp	5	5	Adequately Ava.
168	Tool maker clamp	5	5	Adequately Ava.
	Turning			Adequately Ava.
169	Centre lathe 150	5	0	Not Available
170	Large size lathe 250	5	4	Inadequate
171	Three jaw chuk	5	4	Inadequate
172	Four jaw chuk independent and self centering	2 each	4	Adequately Ava.
173	Faceplate	1	4	Adequately Ava.
174	Taper turning attachment	1 each	3	Adequately Ava.
175	Driving plate	2	3	Adequately Ava.
176	Driving dog	1	5	Adequately Ava.
177	Mandrill - one each of all sizes	1	5	Adequately Ava.
178	Capstan and Turrreth lathes	1	2	Adequately Ava.
179	Screwing machine	5 each	0	Not Available
	Instruments Measuring			
180	Vernier caliper	5	15	Adequately Ava.
181	Micrometers 0-25		10	Adequately Ava.
182	25-50	5	4	Inadequate
183	75-100	5	2	Inadequate
184	Boring tools	5	2	Inadequate
185	Adjustable mandrill	5	4	Inadequate
186	Sleeves: 0-1	1 each	2	Adequately Ava.
187	1-2	1	2	Adequately Ava.
188	2-3	1	2	Adequately Ava.
189	3-4	1	4	Adequately Ava.
190	4-5	1	2	Adequately Ava.
191	Centre drills	1	4	Adequately Ava.
193	Drillsizesal1sizes	1	4	Adequately Ava.
194	Reamers: parallel shank of all sizes	1 each	20	Adequately Ava.
195	Taper reamers- one each of all sizes	1	20	Adequately Ava.
196	Adjustable reamers	1	10	Adequately Ava.
	Knurling Tool			
197	Tapingm3 to m12	2 set	2	Adequately Ava.
198	M6 to M16	2	2	Adequately Ava.
199	Dies: M3 to M12	2	2	Adequately Ava.
200	M6 to M16	2	2	Adequately Ava.
201	Centre finder	2	1	Inadequate
202	Gauges 10mm-50mm	1 each	20	Adequately Ava.
203	Oilcan	2	20	Adequately Ava.
204	Dial indicator	2	5	Adequately Ava.
205	Boring bars	2	1	Adequately Ava.
	Shaping			Adequately Ava.
206	18” shaping machine	3 each	3	Adequately Ava.
207	Swiveling vices	3	3	Adequately Ava.
208	Straight, right and left hand shaping tools	3	3	Adequately Ava.
209	Parallel blocks 8” 200mm	3	10	Adequately Ava.

210	Vee blocks 6”	3	10	Adequately Ava.
211	Surface gauges	3	5	Adequately Ava.
212	Inside and outside calipers copper and hide faced	3	1	Inadequate
213	Hammer	3	5	Adequately Ava.
214	Bevel protractor	2	2	Adequately Ava.
	Slotting Machines			Adequately Ava.
215	Slotting machine (training size)	2	2	Adequately Ava.
216	Parallel blocks	2	2	Adequately Ava.
				Adequately Ava.
217	Swivelling vices	2	3	Adequately Ava.
218	Rotary tables	2	4	Adequately Ava.
219	Vernier calipers	4 each	4	Adequately Ava.
	Milling Cutters			Adequately Ava.
220	complete range of slab cutters	4	5	Adequately Ava.
221	complete set of gearing cutters	4	4	Adequately Ava.
222	assorted slitting saws	4	5	Adequately Ava.
223	assorted side and face cutters	4	4	Adequately Ava.
224	assorted end mills	4	3	Inadequate
225	assorted shell and mills	4	3	Inadequate
226	double angle cutters	4	2	Inadequate
227	single (60) left and right	4	2	Inadequate
228	45° cutter (left and right)	4	3	Available
229	complete range of form cutters (concave and convex)	4	2	Inadequate
230	30° single cutters (left and right)	4	3	Inadequate
231	universal boring heads	4	1	Inadequate
232	slot drills	2 each	1	Inadequate
233	face mill	2 each	1	Adequately Ava.
	Milling Machines			
234	plain milling machine	2	1	Inadequate
235	vertical milling machine	2	1	Inadequate
236	universal milling machine	2	1	Inadequate
	Accessories			
237	dividing head	2	2	Adequately Ava.
238	Tail stock	2	2	Adequately Ava.
239	Indexing plate	2	3	Adequately Ava.
240	Collect chucks	2	1	Inadequate
241	30mm dia arbors	2	1	Inadequate
242	Rotary table	2	1	Inadequate
243	Slotting attachment	2	1	Inadequate
244	Can milling attachment	2	2	Adequately Ava.
245	Coolant pump	2	2	Adequately Ava.
246	Milling clamps	2	2	Adequately Ava.
247	Milling collars	2	2	Adequately Ava.
248	Universal vice	2	2	Adequately Ava.
249	Vertical attachment	2 each	1	Inadequate
250	Medium parallel strips	2 each	2	Adequately Ava.

Drilling Machines

251	Portable breast drill	2	10	Adequately Ava.
252	Sensitive drilling machine	2	4	Adequately Ava.
253	Pillar drilling machine	2	1	Inadequate
254	Radial drilling machine	2	1	Inadequate
255	Drilling machine vice	2	2	Adequately Ava.
256	Solid angle plate	2	4	Adequately Ava.
257	Adjustable angle plate	2	0	Not Available
258	Drills (1mm dis -6mm dia)	2	10	Adequately Ava.
259	Drills (6mm dia—12rnmdia)	2	15	Adequately Ava.
260	Taper shank drills (13mm) diameter-40mm diameter (in steps of 0.5mm)	2	10	Adequately Ava.
261	Taper sleeves of all sizes	2	5	Adequately Ava.
262	Machine reamer 6mm dia to 25mm dia	2	0	Not available
263	Adjustable reamer	2	0	Not available
264	Floating reamer	2	0	Not available
265	Small vee block	2 each	5	Adequately Ava.
266	Large vee block	2	2	Adequately Ava.
267	Countersinking tool of different sizes	2	2	Adequately Ava.
268	Counterboring tools of different sizes	2	2	Adequately Ava.
269	Parallel strips:- Medium size	2	1	Inadequate
270	Large size	2	1	Inadequate
271	Jacob chuck	2 each	0	Not Available
272	Jacob chuck key	2	5	Adequately Ava.
273	Boring bar micrometer	2	2	Adequately Ava.

Planner

274	Planner	2	0	Note Available
275	Strap clamp	2	2	Adequately Ava.
276	U clamp	2	1	Inadequate
277	G. clamp	2	1	Inadequate
		2		
278	T. bolts	2	1	Inadequate
279	Parallel strips — 12mm square to 50mm square	2	2	Adequately Ava.
280	Solid shank cutting tools:	2	1	Inadequate
281	Left hand	2	1	Inadequate
282	Right hand :	2	1	Inadequate
283	Straight	2	3	Adequately Ava.
284	Parting off	2	5	Adequately Ava.
285	Angle plate (solid & adjustable)	2	2	Adequately Ava.
286	Oil can	2	5	Adequately Ava.
287	Grease gum	2	2	Adequately Ava.

288	Vernier height gauge	2	2	Adequately Ava.
289	Vernier caliper (range 350mm)	2	2	Adequately Ava.
300	Vice	2 each	2	Adequately Ava.
	Grinding Machine			
301	Off-hand grinder	2	1	Inadequate
302	Portable grinder	2	2	Adequately Ava.
303	Surface grinder	2	2	Adequately Ava.
304	Cylindrical grinder	2	1	Inadequate

The result in table 4 revealed that 62 items were not available in the workshop of Mechanical Engineering Trades, furthermore, there are many items which constitute the satisfactory workshop facilities in the Mechanical Engineering Trade.

Table 5: A checklist for Determining Adequacy of Facilities for motor vehicle mechanics work.

Motor vehicle mechanics work

S/No	Tools	Minimum Quantity Required	Quantity Available	Remark
	Tool boxes with keys each comprising one of the following items:			
305	Set of flats round, half round & triangular files	10 each	22	Adequately Ava.
306	Set of Warden Fes	10sets	12	Adequately Ava.
307	Flat Chisels	10	22	Adequately Ava.
308	Cross cut chisel	10	15	Adequately Ava.
309	Diamond point chisel	10	10	Adequately Ava.
310	Set of Pin Punches Parallel and taper	10	10	Adequately Ava.
311	Hollow punches Parallel and taper	10each	10	Adequately Ava.
312	Ball pein hammer	10	8	Inadequate
313	Plastic hammers/Mallets	10	22	Adequately Ava.

314	Hacksaws with extra blades	10	20	Adequately Ava.
315	300mm engineers rule	10	10	Adequately Ava.
316	Centre punch	10	8	Inadequate
317	6 – 32mm socket spanner sets with ratchet, brace, extension, U. J. and handles	10	4	Inadequate
318	6 – 32mm open ended flat spanner	10	4	Inadequate
319	6 – 32mm ring spanners	10	10	Adequately Ava.
320	Emery stone / block or cloth	10	8	Inadequate
321	Plug spanners	10	10	Adequately Ava.
322	Magnets spanner	10	0	Not Available
323	Allen keys	10	4	Inadequate
324	Philips screw drivers	10	10	Adequately Ava.

LUB. BAY TYRE/WHEEL SERVICE

325	Compressor 200-300 P.T.S 3 phase motor driven type complete with spray gun, grease, horse reels	1	0	Not available
326	Wheel balance (Rim 13 -15)	1	0	Not available
327	Air line gauge	2	0	Not available
328	Portable tyre inflator	2	0	Not available
329	Steam Cleaner (complete) oil fired or electric	1	0	Not available
330	Oil fired or electric	1		Not available
331	Weld master Vulcanize	1	0	Not available
332	Various sizes wheel braces	3 sets	0	Not available
333	Tyre changer complete with bead breaker	1	0	Not available
334	Heavy duty tyre changer	1	0	Not available
335	Tyre repair kit comprising: rasp, scissors, tyre knife, sticher, spiral wound wire brush etc.	3 sets 3 sets	0	Not available
336	Battery Charger	1	0	Not available
337	Service station set of tool kit e.g. FACOM 2100 or 2080 plus special wrenches for removal of oil filter	2 sets	0	Not available
338	Pipe wrench, clamp or vice	3 sets	2	Inadequate
339	Pipe Cutter	2	0	Not available
340	Wheel alignment gauge	2	0	Not available
341	Plug spanners (long and short)	2	8	Adequately Ava.
342	Battery Service Kit	2 each	0	Not available
343	Adjustable Wrench	3	3	Adequately Ava.
344	Clutch alignment gauge	5	0	Not available
345	Clutch set-screw gauge	2	0	Not available
346	Valve grinders	2	1	Inadequate
347	Injector repair machine	1	0	Not available
348	Injector needle service kit	1	0	Not available

349	Hydrometers	4	0	Not available
350	Vacuum Tester	4	0	Not available
351	Pullers (different sizes)	2	0	Not available
352	Spark plug with vices	4	0	Not available
353	Work bench with vices	2	16	Adequately Ava.
354	Portable engine Hoist	3	0	Not available
355	Torque wrench dial type (metric)	2	0	Not available
356	Hydraulic nipple forming tool	1	0	Not available
357	Flaring tool for steel tubing	1	0	Not available
358	Small bore pipe bending tool	1	0	Not available
359	Carburetor service kit	1	0	Not available
360	Piston ring compressor	2	0	Not available
361	Exhaust gas analyzer	2	0	Not available
362	Axle stands	8	0	Not available

The result in table 4 shows that 15 items were available facilities in Motor Mechanic work. While all the remaining items were not available.

4.2 Research question 2

How adequate are the number of tools and equipment for effective teaching of Mechanical Engineering Trades?

Table 6: Mean Ratings of Technical College Teachers and Students on the adequacy of the number of tools and equipment for effective teaching of Mechanical Engineering Trades

S/No	Items	Students $\bar{X}_1$		Teachers $\bar{X}_2$			Remarks
1	We have adequate equipment in the workshop	1.90	0.28	2.47	0.51	2.18	Inadequate
2	We have enough machine and hand tools in the workshop.	2.37	0.41	1.84	0.51	2.11	Inadequate
3.	We have adequate space for teaching and learning practical	1.53	0.19	3.47	0.84	2.5	Inadequate

	classes.						
4	Government provides machines for teaching of practical yearly.	2.63	0.28	1.27	0.33	1.95	Inadequate
5	There are maintenance officers for daily monitoring of workshop tools and machines.	2.68	0.52	1.92	0.27	2.3	Inadequate
6	Students perform higher in practical areas.	4.30	1.40	4.20	1.16	4.25	Adequate
7	Students are always motivated when involved in practical	3.78	0.65	4.33	1.39	4.06	Adequate
8.	60% percent of the students have credit and above in the last practical (examination)	1.93	0.25	3.13	0.87	2.53	Inadequate
9	Students score higher in the subjects that involved practical than other ones that do not involve practical.	3.75	0.62	4.07	1.12	3.91	Adequate

The results presented in the table 5 above shows the grand mean and the standard deviations of the respondents. The table shows that mechanical engineering trade teachers agreed with item 6, 7, 9 and disagreed with item 1, 2, 3, 4, 5, and 8. Item seven (with mean 4.33) has the highest rating which was students are always motivated. When involved in practical. Item four (with mean 1.27) has the lowest rating which said government provides machines for teaching of practical yearly. The mechanical engineering students agreed with items 6, 7, 9 and disagreed with item 1, 2, 3, 4, 5, and 8. Item six (with mean 4.30) has the highest rating which was students perform higher in practical areas. Item three has the lowest rating which said we have enough machines and hand tools in the workshop. A deduction from the table also reveals that both teachers and students agreed on items 6, 7, 9and disagreed on 1, 2,3, 4, 5 and 8. This shows that their responses do not vary much.

4.3 Research Question 3

What are the safety measures employed by teachers in the use of workshop facilities? The results of analysis of data based on this research question is shown on table 7

Table 7: Mean and Standard Deviation of responses of mechanical engineering trade teachers and students on safety measures employed in the use of workshop facilities.

S/No	Statement	$\bar{X}_1$	S.D	$\bar{X}_2$	SD	G $\bar{X}$	Remarks
10	The workshop working space is not congested.	4.30	1.40	3.67	1.11	3.99	Agree
11	The machine parts are well positioned	2.37	0.41	3.93	1.06	3.15	Disagree
12	There is adequate provision of first aid equipment	2.13	0.19	2.12	0.33	2.13	Disagree
13	Arrangement of the work benches allow free movement of students and teachers	3.66	1.01	3.93	1.13	3.80	Agree
14	There is provision for emergency exit and it is not difficult to open.	4.35	1.39	4.67	1.73	4.51	Agree
15	Safety goggles are provided and in good condition.	3.27	0.76	3.33	0.82	3.30	Disagree
16	Gas cylinders are properly installed and leak proof	3.78	0.65	3.73	1.11	3.76	Agree
17	Machine tools and equipment are regularly maintained.	2.53	0.51	3.16	0.86	2.85	Disagree
18	There is sufficient guiding instruction on machine operation.	3.13	0.47	3.80	1.09	3.47	Disagree
19	There is adequate provision for natural and artificial light.	3.73	0.86	4.47	1.35	4.1	Agree
20	There is adequate provision of widows and electric fans.	3.67	0.88	4.20	1.39	3.94	Agree
21	There is adequate provision of fire fighting equipment.	2.00	0.15	2.93	0.61	2.47	Disagree
22	The available fire extinguishers can be easily operated by students and staff.	2.13	0.19	4.40	1.41	3.27	Disagree
23	The teachers always outline safety precautions before each practical lesson.	2.97	0.49	3.80	0.85	3.39	Disagree
24	All powers points, outlets, and switches are properly earthed.	2.72	0.51	3.93	0.99	3.32	Disagree

Table 7 above shows that mechanical engineering trade students agreed with item 10, 13, 14, 16, 19, 20, and disagreed with item 11, 12, 15, 17, 18, 21, 22 and 23 item 14 (with mean (4.35) has

the highest rating which was on there is provision for emergency exit and it is not difficult to open. Item 21 (with mean 2.00) has the lowest rating which said there is adequate provision of fire fighting equipment. The mechanical engineering trade teachers, agreed with 10, 11, 13, 14, 16, 20, , 22, 23, and disagreed with items 12, 15, 17 and 21. Item 14 (with mean 4.67) has the highest rating which was on there is provision for emergency exit and it is not difficult to open. Item 12 (with a mean 2.12) has the lowest rating which was on there is adequate provision of first aid equipment.

4.4 Research Question 4

What are the practices adopted by the Administrators and teachers in the maintenance, storage and control of workshop tools and equipments?

Table 8: Mean and Standard Deviation of responses of mechanical engineering students and teachers on practices adopted by the administrators and teachers in the maintenance, storage and control of workshop tools and equipments.

S/No	Statement	$\bar{x}_1$	S.D	$\bar{x}_2$	SD^2	$\bar{x}_G$	Remarks
	MAINTENACE						
25	All machines in the workshop are lubricated at regular interval.	1.90	0.28	3.13	0.57	2.52	Disagree
26	Broken and worn parts are replaced	2.37	0.47	2.80	0.57	2.59	Disagree

	and repaired.						
27.	Spare parts of equipment procured are provided against equipment failure.	2.13	0.19	3.40	0.69	2.77	Disagree
28	Preventive maintenance is carried out promptly on the workshop machines/equipment.	2.63	0.28	2.87	0.65	2.75	Disagree
29	Daily cleaning of the school workshop.	2.72	0.51	2.40	0.36	2.56	Disagree
30	Equipment manuals are readily available.	4.30	1.40	2.80	0.45	3.55	Agree
31	Safety instructions are provided in the workshop.	3.78	0.65	3.60	1.24	3.19	Disagree
32	The school services the equipment at regular intervals.	2.53	0.51	2.13	0.48	2.33	Disagree
33	Specialize maintenance personnel are provided in the school workshop.	1.90	0.28	2.00	0.55	1.95	Disagree
	STORAGE						
34	Workshop equipment and tools are kept solely under the care of the teaching staff.	2.13	0.19	3.53	0.89	2.83	Disagree
35	Racks are provided for storage of wood, metal plates etc in the workshop.	2.72	0.51	4.40	1.21	3.56	Agree
36	Materials in the workshop are stored according to their characteristics.	4.30	1.40	4.33	1.24	4.32	Agree
37	Materials in the workshop are stored according to their sizes.	3.78	0.65	4.33	1.42	4.06	Agree

38	Materials in the workshop are stored according to their similarities.	2.53	0.51	4.33	1.42	3.43	Disagree
39	Tools in the workshop are kept in the tool crib/room.	3.40	1.11	4.13	1.17	3.77	Agree
40	Tools in the workshop are kept in the tool cabinet.	2.37	0.41	4.00	1.19	3.19	Disagree
41	Bench tool storage facilities are provided in the school workshop.	2.13	0.19	3.13	0.61	2.63	Disagree
42	The equipment and materials are kept solely under the care of the storekeeper.	2.72	0.51	2.73	0.59	2.73	Disagree
	CONTROL						
43	The inventory system is effective.	2.63	0.28	4.33	1.24	3.48	Disagree
44	The principals are involved in direct control of workshop facilities.	2.87	0.47	3.00	0.88	2.94	Disagree
45	Proper records keeping of all workshop facilities of all workshop facilities are carried out.	2.63	0.28	2.27	1.11	2.45	Disagree

Where $\bar{X}$1= Mean responses of teachers

$\bar{X}$2= Mean responses of administrators

$\bar{X}$G= Grand mean

From table above, the opinion of students showed that they agreed with items 30, 31, 38, 39, and disagreed with items 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 40, 41, 42, 43, 44, and 45. Items 30, and 38 (with mean 4.30) has the highest rating which was equipment manuals are readily available. Also item 38 which was materials in the workshop are stored according to characteristics. While item twenty-five (with mean 1.90) has the lowest rating which was on all machines in the workshop are lubricated at regular interval. The teachers agreed with item 31,

35, 37, 38, 39, 40, 41, 42, 44, and disagreed with 25, 26, 27, 28, 29, 30, 33, 34, 36, 43, and 45. Item 37 (with mean 4.40) has the highest rating which was rack are provided for storage of wood, metals, plates etc. in the workshop. Item 33 (with mean 2.00) has the lowest rating which was specialized maintenance personnel are provided in the school workshop.

4.5 Hypothesis One

There is no significance difference in the mean ratings of Teachers and students on the adequacy of tools and equipment for effective teaching of Mechanical Engineering trades.

Table 9: t-test table for students and teachers on the adequacy of tools and equipment for effective workshop practice.

Respondent	No	Mean $\bar{x}$		t-cal..	t-crit.	Remarks
Students	300	2.750	0.45	-0.43	$\pm$2.12	Accepted
Teachers/administrators	75	2.966	0.47			

Since the calculated t-value (0.4353) at 0.05 level of significance is less than the table or critical t-value ($\pm$ 2.1199) the null hypothesis was upheld that there is no significance difference in the mean rating of teachers and students on the adequacy of tools and equipment for effecting teachings.

4.6 Hypothesis Two

There is no significant difference in the mean ratings of teachers and students on the safety measures employed by teachers in the workshop.

Table 10: t-value table for students and teachers/administrators on safety measures employed by teachers in the workshop.

Respondent	No	Mean $\bar{x}$	t-cal.	t-crit.	Remark
Students	300	3.1164	-2.36	$\pm$2.053	Rejected
Teachers/administrators	75	3.7387			

The analysis in table 10 above shows a t-calculate value of -2.36. While t-critical yielded a value of $\pm$ 2.05. Since the value of t- calculated is greater than t- critical the null hypothesis was therefore rejected, hence there was significant difference in the mean of the responses given by teachers and students on safety measures employed by teachers in the workshop.

4.7 Hypothesis Three

There is no significance difference in the mean ratings of teachers and students on practices adopted in the maintenance, storage and control of workshop tools and equipments

Table 11: t-test table for students and teachers/administrators on practices adopted of workshop tools and equipments.

Respondent	No	Mean $\bar{x}$	SD^2	t-cal.	t-crit.	Remark
Students	300	2.78333	0.88	- 2.70	2.021	Rejected
Teachers/administrators	75	3.41269	0.72			

The analysis in table 6 above shows a t – calculated value of – 2.6981 while t - critical yielded a value of 2.0 211 at 0.05 level of significance. Since the value of t – calculated is greater than t – critical, the null hypothesis was therefore rejected; hence there is signify cance in the mean responses of teachers and students on the practices adopted in the maintenance, storage and control of workshop tools and equipment.

4.8.1 Findings of the Study

The following findings emerged from the study based on the research questions and hypotheses tested.

1. A check-list for determining availability of workshop facilities in different trades' areas of Mechanical Engineering shows that-

i. Most items in welding and fabrication workshops are completely not available.

ii. Basic hand tools were available but inadequate.

iii. Power driven machines and equipment are completely not available or obsolete.

iv. Tools and equipment where available is less than acceptable, needs improvement on wide scale.

In general, the observational checklist indicates a need for attention and improvement on the teaching facilities.

2. Common hand tools and equipment were inadequate.

3. Items listed require improvement in the workshop facilities in mechanical engineering workshop.

i. The workshop working space

ii. Machine part positioned

iii. Adequate provision of equipment

iv. Machine tools and equipment need regular maintenance

v. Provision of fire fighting equipment

vi. Power point, out lets and switches need to be properly earthed

The findings showed that the necessary safety measured are not observed in the college workshop.

4. Practices adopted by the Administrators and teachers in the maintenance, storage and control of workshop tools and equipments reveals that:

i. All machines require lubrication at regular interval

ii. Broken and worn part need replacement or repair

iii. Preventive maintenance to be promptly carried out

iv. Control of workshop facilities

v. For proper records keeping of workshop facilities

vi. Improved in storage facilities and tools

vii. Inventory system is ineffective

It was the view of the respondents that the proper inventory system and facilities were not kept. This was indicated on item 43.

The result of the findings as indicated in items 40 and 41, showed that technical workshop lack adequate storage facilities.

4.8.2 Discussion Of The Findings

The finding of this study have been organized and discussed according to the four research questions and three hypothesis formulated. The research questions are discussed first, followed by hypothesis as outlined below.

Findings of this Study reveals that all the items on the availability of workshop facilities were found as required by the National Board for Technical Education (NBTE). It is also evidence that Basic hand Tools were available but inadequate, while power driven machines and equipment are completely not available or obsolete The mechanical engineering trades did not have adequate facilities.

The observational checklist shows that there were not adequate tools and equipment for workshop facilities, for any meaningful occupational skills to be acquired. Tools and equipment are essential for any skill acquisition programme. This was justified by the observation of Orikpe (1994) citing Uzoagulu (1992) when he stated that when equipment are not adequate or functional, vocational technical training programmed will suffer and will lead to the production of highly unskilled personnel, who are not productive and unemployable. Also Okoro (1991) pointed out that facilities and equipment are very important to any educational programmed. When they are inadequate the programme suffers. This may be the reason why many graduated are unemployed.

The result for table 6 revealed that most of the technical college workshop lack adequate hand tools and equipment to go proportional to the number of students. However if technical institutions are to provide their trainees with the skill relevant to the need of the industry then there must be adequate provision of facilities and equipment, for effective teaching of mechanical engineering trades. This finding is in line with Eule (2000) who argued that students practical work in school workshop and laboratory demands adequate consumable material, functional machines and accessories, adequate hand tools and adequate power supply.

On the adequacy of workshop facility, the findings indicated that majority of the technical college workshop do not have adequate facilities. Table 6 revealed that machines and hand tools are inadequate. This is in line with the work of Abdullahi (2003) that every training schools faces the problems of providing and maintain suitable workshop and appropriate facilities for technical and vocational training programs. These finding were also supported by Moja (2000) that the problems of Technical and Vocational Education (TVE) in Nigeria are made worse by the poor condition/inadequacy of training facilities. In the same vein, Uzoagulu (1992) warned that were equipment and tools are not functional or adequately provided technical

training programs will suffer and will lead to the production of highly unskilled personnel who are unemployable and unproductive. Therefore inadequate workshop facilities in technical college programs deterred skill acquisition, only a few workshop facilities in the technical college are adequate according to the findings.

The analysis on Table 9 shows that the null hypothesis was not rejected this means that there is serious shortage of facilities in technical college workshops with the two categories of respondents attesting to it. These confirm the study conducted by Aina (1999) that some colleges lack not only workshops and laboratories but also where such provided; they are ill- equipped and lack the basic tools and equipment for instruction. This implies that facilities need to be provided in the technical college workshops for efficient response to society needs.

With reference to the safety measure employed by teachers in the use of workshop facilities in technical college workshops, findings on Table 7 revealed that there are no good safeties measures employ by teachers in the use of workshop facilities. These finding agreed with that of Abbas (1998) the teachers needed to provided well organize and complete safety instructions with periodic inspections to determine the safety precaution that are observed to work in. Winter (1980) also support this assertion that in the maintenance of school workshop of the most important phase is the maintenance of safety devices on machines and their immediate adjustment or repair when found not to be in order. The study in the same vein corroborate Gana (1992) assertion that aged tools such as chisel and knives are safety to handle when sharp than when dull, while sharp plane, are dangerous when dull, than when properly sharpened. He further stated that all tools need constant sharpening.

On practices adopted by Administrator and teachers on the storage, maintenance and control of workshop tools and equipment, the finding revealed that most teachers did not apply the appropriate principle needed for maintenance storage and control of equipment in the

workshop. This is in consonance with Olaitan (1999) that in every occupation, laboratory, tools and equipment needed to provide various skills should be made available. These tools should be in constant use by both staff and learners and should be kept in good condition and control.

Dabban and Abbas (2000) stated that periodic oiling or greasing of machines reduces the wear of moving parts and prolongs the life of equipment. It is therefore important to organize the maintenance activities by college administrators so that student will be involved in the roper servicing of such equipment at the designated time. It is important to lubricate machine at regular intervals as it is necessary to have automobile lubricated after moving every thousand mile. Supporting this assertion, Onuoha (2000) opined that lack of planned maintenance policy, fund and spare parts seriously affected maintenance of facilities in the student workshop. And this will affect the basic principles and technique in teaching and learning of mechanical trades.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of the statement of the problems, the procedure used in carrying out the study, summary of major findings, conclusion and implication of the study; finally recommendations were made based on the finding as well as suggestions for further studies.

5.1 Re-statement of the problem

It has been asserted that technology education in secondary and post secondary schools in Nigeria is not properly organized and practiced because facilities and equipment are out dated (Momoh, 1985). Eferakeya (1989) asserts that all over the country schools are burdened with

both empty buildings and halls without basic equipment, or materials and equipment, which cannot be used because there are no buildings in which to install them. For this reasons mechanical engineering trade students in technical colleges are faced with such problems as inability to acquire the desired skills to be self reliant and gainfully employed.

This research is, therefore, to evaluate the workshop facilities for teaching and learning mechanical engineering trade in technical colleges in Kaduna State.

5.2 Summary of procedure used for this study

To carry out the study, the evaluative design was adopted. Mechanical Engineering Trade teachers and students constituted the subjects for the study. A sample size of 410 technical teachers and students were used. The area of the study was Kaduna State and six technical colleges were used.

Four research questions and three null hypotheses were formulated and tested at 0.05 level of significant. Relevant theoretical framework and literatures were reviewed. The structure questionnaire and check-lists designed to provide response options to generate items using a likert type rating scale was used to collect data. The questionnaire was divided into four sections. Section A was structured to collect personal data from the respondents, while section B-D was designed to collect information used to answer the research questions.

Four experts in Technology Education Department validated the research instruments. Their comments, advice and suggestions were used for the development of the final instrument for the study. The reliability of the developed instrument was determined using the split-half technique with 10 students and 2 teachers selected from two technical colleges in Kano State. The collected data were analyzed using means and t-test statistic for the hypotheses which guided the study. The decision rule for the mean score point analysis was that any item with mean score value less than the mean response value (3.50) was rejected or disagreed upon while

items with mean score value 3.50 and above were accepted or agreed upon. The 410 questionnaires were administered to the respondents and collected back by the researcher.

5.3 Summary of major findings of the study

Based on the result of data analyzed, the following major findings have been made:

1. The safety measures employed by teachers in the use of workshop facilities are inadequate.
2. There are no adequate numbers of tools, equipment and machines in the mechanical engineering trade workshops.
3. Some of the training facilities for the various occupation trade areas of mechanical engineering were inadequate for any meaningful teaching and learning.
4. Practices adopted by administrator and teachers in the maintenance, storage and control of workshop tools and equipments are ineffective.

5.4 Conclusion

The desire to produce competent graduates of technical colleges can be achieved when the facilities in the workshop are relevant and adequate for the programs as demanded by the curriculum. This study has shown that facilities in technical college workshops in the state are inadequate. Hence, the call for immediate action.

5.5 Implication of the study

The results of the findings of this study have provided some useful educational implications. It has revealed principally that workshops, tool, equipment, machines and materials are insufficient in the technical colleges for effective teaching and learning of mechanical

engineering trade. It also revealed that the number of mechanical engineering teachers in the colleges and qualified number of workshop personnel are equally inadequate.

The implication of inadequate facilities for technical education on the nation will among others include: low level of advancement, low productivity, high level of unemployment, poverty will engulf the nation, overdependence on foreign nations for materials and human resources, high level of crime, political and economic instability, shortage of qualified vocational technical teachers, insecurity of lives and property, conflicts, over dependence on few people working.

The lack of adequate facilities in technical education today, are the major cause of lack of human capital in some of the most essential sectors of the economy. The findings of this study have provided important implication to the stakeholders in charge of planning and implementation of technical colleges programme such as the National Board for Technical Education (NBTE), National Business and Technical Education Board (NABTEB), principal of technical colleges, technical teachers, students and employers of mechanical engineering trade graduates.

The implication to the stakeholders are that facilities used for teaching mechanical engineering trades should be assessed from time to time to determine their functionality as well as whether they are absolute or modern for training craftsmen that will fit into the challenges of modern industries or establishment. Other implications are that inadequate funding leads to inadequate or prior facilities and other related problem in a vicious circle.

5.6 Recommendations

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

1. That the stakeholders should made adequate and appropriate provisions of tools, equipment, machines, and materials for the effective teaching of mechanical engineering

trade course in technical colleges to ensure effective maintenance activities and teaching practical skills.

2. That adequate number of qualified workshop personnel should be employed in all technical colleges to ensure effective maintenance activities and teaching of practical skills.
3. That construction of new standard workshop and renovation of existing ones to meet standard need to be embarked upon.
4. That private sector should be encouraged to initiate and participate in the provision of facilities.
5. That special intervention funds should be set aside by Government for procurement of workshop facilities to technical colleges, such channels may include Education Tax Fund (ETF) as practiced in Nigeria; Non Governmental Organizations (NGOs), Parent Teacher Association (PTA), and Community Based Organizations (CBOs) should be asked for support in supplying relevant facilities to the workshops as obtained in some nations;
6. That a specific percentage of income tax generated annually by the Government should be utilized for provision of workshop facilities in technical colleges.

5.7 Limitations of the study

a. The post-election crisis leads to distraction of the researcher attention for some time.

b. Lack of cooperation from some of the teachers and administrators in the school affects the retuned of the instrument.

5.8 Suggestion for Further Study

The following areas have been suggested for study:

1. Evaluation of workshop facilities for teaching and learning Mechanical Engineering Trade in North Western Nigeria.
2. Follow-up-study of the graduate of Mechanical Engineering Trade in Northern Nigeria.

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APPENDIX A

Department of Technology Education
Modibbo Adama University of Technology
Yola
Date ……..

Dear Respondents,

REQUEST FOR COMPLETION OF RESEARCH QUESTIONNAIRE

I am a postgraduate student of the above named University caring out a research project on the topic "Evaluation of Workshop Facilities for Teaching Mechanical Engineering Trades in Technical Colleges in Kaduna State"

You are please requested to provide answers to the questions raised in the questionnaire. This is purely for academic purposes and all information supplied will be treated with strict confidence and used only fore the purpose of this research.

Thank for your co-operation.

Yours faithfully,

MANYA MAIGARI ANDREW

QUESTIONNAIRE ON EVALUATION OF WORKSHOP FACILITIES FOR TEACHING MECHANICAL ENGINEERING TRADES IN TECHNICAL COLLEGES IN KADUNA STATE

SECTION A: PERSONAL DATA

Name of your school……..……...

Sex…….Age……..……. Qualification……..

Area of specialization……..……. Teaching experience ……..

A checklist for Determining Availability of Facilities for Welding and Fabrication

S/No	Tool	Minimum Quantity Required	Quantity Available	Remarks

1	Power guillotine of capacity 10 swg x 36 in length	2
2	Treadle guillotine of capacity 20 swg x 36 in length	2
3	Swing beam folder 10 swg x36" capacity	2
4	Bending roller capacity 40" x2" diameter	2
5	Bending roller capacity 18 x L5" diameter	2
6	Bench mounted cone roller	5
7	Hand operated copper capacity 3/32" in mild steel	5
8	Power bench grinding machine	2
9	Double ended buffer and polisher	2
10	Universal beading and swaging machine	2
11	Power-operated drilling machine maximum capacity 3/8"	2
12	Wheeling machine	2
13	Fly press	1
14	Hand nibbling machine	2
15	Left & Right hand snip	5 each
16	Straight snips	5
17	A Kit" of tools consisting of hammer, mallet, steel, rule, scriber and wing compass, etc	5
18	Bench shears	2
19	Power saw cutting machine 10mm	1
20	Disc cutting machine	2
21	Profile cutting machine with gas cutting nozzles	2
22	Pillar drilling machine	2
23	Louver shearing machine (manual)	2
24	Overhead crane	2
25	Straightening machine	1
26	Cropping machine	2
27	Straight edge	2
28	Trammels dividers (set)	10
29	Hammers	10
30	Chisels	10
31	Punches	10
32	Try-square	10
33	Steel rules	10
34	Smith open forge	10
35	Vee Blocks	2
36	Electrode holders	10
37	Electrode Drying oven	10
38	Heavy duty grinding machine	2
39	Bench-type grinding machine	2
40	CO2 cylinders	2
41	Transformers with rectifiers (with all attachments)	5
42	Aprons (Assorted)	10
43	Hand gloves	20
44	Hand shields heir caps	20
45	Wire brushes	10

46	Electrical heaters	10
47	Pliers	2
48	Gas welding goggles	10
49	Double cylinder trolley	5
50	Oxygen regulators	2
51	Acetylene regulators	5
52	Hoses, clips and all attachments (sets)	5
53	Blowpipes (low and high pressured)	5
54	Tongs	5
55	Combined set of cutting & welding outfit	5
56	Power operated profile cutter with turntable	5
57	D.C. generator with all connections	2
58	A/C transformer (Argon) with all the connections	5
59	Argon cylinder	5
60	Regulators with flow meters	5
61	Hacksaws and blades	5
62	Water to carbide generators	10
63	Carbide to water generators	4
64	Overhead projector	4
65	Computer set	1
66	Anvil	2
67	Swage blocks	2
68	Chipping hammers	20
69	Plain goggles	20
70	First and boxes	2
71	Sledge hammers	2
72	G. Clamp-assorted	20
73	Self grip pliers-assorted	6
74	Flatters	3
75	tic Clamps	6
76	Mole grips	6
77	Arc Welding Booths	8
78	Gas Welding Booths	4

A checklist for Determining Adequacy of Facilities for Mechanical Engineering Craft Practice.

S/No	Tools	Minimum Quantity Required	Quantity Available	Decision
	FITTING			
79	Vices 150mm	22		

80	Benches	6
81	Hacksaws	20
	FILES	22 each
82	250mm flat rough	,,
83	10” hand rough	,,
84	10” round rough	,,
85	10” three rough	,,
86	10” square rough	,,
87	10” half round 2nd cut	,,
88	200mm warding file	,,
89	100” retail file	,,
90	Wallets of warding files	,,
91	Steel rules (12”) 300m	20
92	Tape rule 3000mm	20
93	Dividers	10
94	Scribers	10
95	Pocket size (200mm) vernier	10
96	Calipers	10
97	Centre punches	10
98	(1/2 1b) hammer 3/4 kg	5
99	(11/21ib) hammer 3/4kg	5
100	Oil can	5
101	Pair of pliers 150mm	20
102	Tool box & lock odd-leg calipers	10
103	Odd-leg calipers	20
104	Engineers squares 100	5
105	Screw drivers 200mm	5
106	Pair of tin slip nippy vice	5
	Fitting — Workshop Equipment	
107	Drilling machines sensitive	4
108	Drilling machines pillar	4
109	Drilling machines Radial	4
110	Surface table 12000 x 12000mm (4’x4’)	2
111	Surface plates 500 x500mm (18”xl8”)	2
112	Surface Gauge	2
113	Vernier Height Gauges	2
114	Vee blocks 100 x 100mm pairs	4
115	Vee blocks 200mm	4
116	Parallels strips (pairs) 37 x 25x300	4
117	Flat scrapers	4
118	Half round scrapers	4
119	Triangular scrapers	4
120	Metric sets 3mm-12mm	5
	(BA) 150 sets 0-10	5
121	Sockets spanners 3-22mm	5
122	Open ended 3-22mm ‘spanner)	5

123	Pedestal grinders	2
124	Reamers 3-25mm	3 set
125	Reamers machine 3.25mm	3
126	Dial gauge	3
127	Chisels	10 each
128	Drills	5 each
129	Straight shank 11/2-10mm	,,
130	Straight shank 6 - 15mm	,,
131	Taper shank 3-22mm	,,
132	Drift	2
133	Heat treatment furnace (medium. size)	3
134	Micrometer 0-25	3
134	25-50	3
135	50-75	3
136	75-100	3
137	100- 125	3
138	125-150	3
139	Protractors	3
140	Bevel	3
141	Combination sets	3
142	Vernier	3
143	Optical	
144	Limit Gauge	2
145	Telescopic gauges	2
146	Plug gauges	2
147	Slip gauges (set)	2
148	Feeler 05-64	2
149	Engineers squares 150mm	2
150	Caliper	2
151	Screw pitch gauges	2
152	Blacksmith forge (gas)	2
153	Blacksmith tools	2
154	Anvil, hammers, chisels fuller, shape	2 each
155	Block, pinches and drifts	2
156	Tongues of different types	2 each
157	Arboy press	2 each
158	Extractors	2
159	Snips (tin sheat) 200mm	2
160	Stud extractors	2
161	Circlip plier (internal & external)	2
162	Pipe wrench 250mm	2
163	Pipe wrench 250mm	2
164	Self grip wrench of mole grip	1
165	Pipe sender	1
166	Gullotine machine	5
167	G. clamp	5
168	Tool maker clamp	5
	Turning	

169	Centre lathe 150	5
170	Large size lathe 250	5
171	Three jaw chuk	5
172	Four jaw chuk independent and self centering	2 each
173	Faceplate	1
174	Taper turning attachment	1 each
175	Driving plate	2
176	Driving dog	1
177	Mandrill - one each of all sizes	,,
178	Capstan and Turrreth lathes	,,
179	Screwing machine	5 each
	Instruments Measuring	
180	Vernier caliper	,,
181	Micrometers 0-25	
182	25-50	,,
183	75-100	,,
184	Boring tools	,,
185	Adjustable mandrill	,,
186	Sleeves: 0-1	1 each
187	1-2	,,
188	2-3	,,
189	3-4	,,
190	4-5	,,
191	Centre drills	,,
193	Drillsizesal1sizes	,,
194	Reamers: parallel shank of all sizes	1 each
195	Taper reamers- one each of all sizes	,,
196	Adjustable reamers	,,
	Knurling Tool	
197	Tapingm3 to m12	2 set
198	M6 to M16	,,
199	Dies: M3 to M12	,,
200	M6 to M16	,,
201	Centre finder	,,
202	Gauges 10mm-50mm	1 each
203	Oilcan	2
204	Dial indicator	2
205	Boring bars	2
	Shaping	
206	18” shaping machine	3 each
207	Swiveling vices	,,
208	Straight, right and left hand shaping tools	,,
209	Parallel blocks 8” 200mm	,,
210	Vee blocks 6”	,,
211	Surface gauges	,,
212	Inside and outside calipers	,,

	copper and hide faced	
213	Hammer	,,
214	Bevel protractor	2
	Slotting Machines	
215	Slotting machine (training size)	,,
216	Parallel blocks	,,
217	Swivelling vices	,,
218	Rotary tables	,,
219	Vernier calipers	4 each
	Milling Cutters	
220	complete range of slab cutters	4
221	complete set of gearing cutters	,,
222	assorted slitting saws	,,
223	assorted side and face cutters	,,
224	assorted end mills	,,
225	assorted shell and mills	,,
226	double angle cutters	,,
227	single (60) left and right	,,
228	45° cutter (left and right)	,,
229	complete range of form cutters (concave and convex)	,,
230	30° single cutters (left and right)	,,
231	universal boring heads	,,
232	slot drills	2 each
233	face mill	2 each
	Milling Machines	
234	plain milling machine	,,
235	vertical milling machine	,,
236	universal milling machine	,,
	Accessories	
237	dividing head	,,
238	Tail stock	,,
239	Indexing plate	,,
240	Collect chucks	,,
241	30mm dia arbors	,,
242	Rotary table	,,
243	Slotting attachment	,,
244	Can milling attachment	,,
245	Coolant pump	,,
246	Milling clamps	
247	Milling collars	,,
248	Universal vice	,,
249	Vertical attachment	2 each
250	Medium parallel strips	2 each
	Drilling Machines	
251	Portable breast drill	,,

252	Sensitive drilling machine	,,
253	Pillar drilling machine	,,
254	Radial drilling machine	,,
255	Drilling machine vice	,,
256	Solid angle plate	,,
257	Adjustable angle plate	,,
258	Drills (1mm dis -6mm dia)	,,
259	Drills (6mm dia—12rnmdia)	,,
260	Taper shank drills (13mm) diameter-40mm diameter (in steps of 0.5mm)	,,
261	Taper sleeves of all sizes	,,
262	Machine reamer 6mm dia to 25mm dia	,,
263	Adjustable reamer	,,
264	Floating reamer	,,
265	Small vee block	2 each
266	Large vee block	,,
267	Countersinking tool of different sizes	,,
268	Counterboring tools of different sizes	,,
269	Parallel strips:- Medium size	,,
270	Large size	,,
271	Jacob chuck	2 each
272	Jacob chuck key	,,
273	Boring bar micrometer	,,
	Planner	
274	Planner	,,
275	Strap clamp	,,
276	U clamp	,,
277	G. clamp	,,
278	T. bolts	,,
279	Parallel strips — 12mm square to 50mm square	,,
280	Solid shank cutting tools:	,,
281	Left hand	,,
282	Right hand :	,,
283	Straight	,,
284	Parting off	,,
285	Angle plate (solid & adjustable)	,,
286	Oil can	,,
287	Grease gum	,,
288	Vernier height gauge	,,
289	Vernier caliper (range 350mm)	,,
300	Vice	2 each
	Grinding Machine	
301	Off-hand grinder	,,
302	Portable grinder	,,
303	Surface grinder	,,

304	Cylindrical grinder	,,

Motor vehicle mechanics work

S/No	Tools	Minimum Quantity Required	Quantity Available	Remarks
	Tool boxes with keys each comprising one of the following items:			
305	Set of flats round, half round & triangular files	10 each		
306	Set of Warden Fes	10sets		
307	Flat Chisels	10		
308	Cross cut chisel	10		
309	Diamond point chisel	10		
310	Set of Pin Punches Parallel and taper	10		
311	Hollow punches Parallel and taper	10each		
312	Ball pein hammer	10		
313	Plastic hammers/Mallets	10		
314	Hacksaws with extra blades	10		
315	300mm engineers rule	10		
316	Centre punch	10		
317	6 – 32mm socket spanner sets with ratchet, brace, extension, U. J. and handles	10		
318	6 – 32mm open ended flat spanner	10		
319	6 – 32mm ring spanners	10		
320	Emery stone / block or cloth	10		
321	Plug spanners	10		
322	Magnets spanner	10		
323	Allen keys	10		
324	Philips screw drivers	10		

LUB. BAY TYRE/WHEEL SERVICE		
325	Compressor 200-300 P.T.S 3 phase motor	1

	driven type complete with spray gun, grease, horse reels	
326	Wheel balance (Rim 13 -15)	1
327	Air line gauge	2
328	Portable tyre inflator	2
329	Steam Cleaner (complete) oil fired or electric	1
330	Oil fired or electric	1
331	Weld master Vulcanize	1
332	Various sizes wheel braces	3 sets
333	Tyre changer complete with bead breaker	1
334	Heavy duty tyre changer	1
335	Tyre repair kit comprising: rasp, scissors, tyre knife, sticher, spiral wound wire brush etc.	3 sets 3 sets
336	Battery Charger	1
337	Service station set of tool kit e.g. FACOM 2100 or 2080 plus special wrenches for removal of oil filter	2 sets
338	Pipe wrench, clamp or vice	3 sets
339	Pipe Cutter	2
340	Wheel alignment gauge	2
341	Plug spanners (long and short)	2
342	Battery Service Kit	2 each
343	Adjustable Wrench	3
344	Clutch alignment gauge	5
345	Clutch set-screw gauge	2
346	Valve grinders	2
347	Injector repair machine	1
348	Injector needle service kit	1
349	Hydrometers	4
350	Vacuum Tester	4
351	Pullers (different sizes)	2
352	Spark plug with vices	4
353	Work bench with vices	2
354	Portable engine Hoist	3
355	Torque wrench dial type (metric)	2
356	Hydraulic nipple forming tool	1
357	Flaring tool for steel tubing	1
358	Small bore pipe bending tool	1
359	Carburetor service kit	1
360	Piston ring compressor	2
361	Exhaust gas analyzer	2
362	Axle stands	8

SECTION B:

Instructions: Please indicate by ticking (√) in the option that best describes your level of agreement with the statement.

Below are keys for the alternative responses

SA= Strongly agree

A= Agree

UD= Undecided

D= Disagree

SD= Strongly disagree

S/No	Items	SA	A	UD	D	SD
1	We have adequate equipment in the workshop					
2	We have enough machine and hand tools in the workshop.					
3.	We have adequate space for teaching and learning practical classes.					
4	Government provides machines for teaching of practical yearly.					
5	There are maintenance officers for daily monitoring of workshop tools and machines.					
6	Students perform higher in practical areas.					
7	Students are always motivated when involved in practical					
8.	60% percent of the students have credit and above in the last practical (examination)					
9	Students score higher in the subjects that involved practical than other ones that do not involve practical.					

SECTION C

S/No	Statement	SA	A	UD	D	SD

10	The workshop working space is not congested.					
11	The machine parts are well positioned					
12	There is adequate provision of first aid equipment					
13	Arrangement of the work benches allow free movement of students and teachers					
14	There is provision for emergency exit and it is not difficult to open.					
15	Safety goggles are provided and in good condition.					
16	Gas cylinders are properly installed and leak proof					
17	Machine tools and equipment are regularly maintained.					
18	There is sufficient guiding instruction on machine operation.					
19	There is adequate provision for natural and artificial light.					
20	There is adequate provision of widows and electric fans.					
21	There is adequate provision of fire fighting equipment.					
22	The available fire extinguishers can be easily operated by students and staff.					
23	The teachers always outline safety precautions before each practical lesson.					
24	All powers points, outlets, and switches are properly earthed.					

SECTION D

Research Question 4

What are the practices adopted by the Administrators and teachers in the maintenance, storage and control of workshop tools and equipments?

The following are the various practices in the maintenance, storage and control of workshop tools and equipment in Technical colleges. Please indicate by ticking (√) how you agree or disagree with any of the practices as it applies to your school.

S/No	**Statement**	SA	**A**	UD	**D**	**SD**
25	All machines in the workshop are lubricated at regular interval.					
26	Broken and worn parts are replaced					

	and repaired.
27.	Spare parts of equipment procured are provided against equipment failure.
28	Preventive maintenance is carried out promptly on the workshop machines/equipment.
29	Daily cleaning of the school workshop.
30	Equipment manuals are readily available.
31	Safety instructions are provided in the workshop.
32	The school services the equipment at regular intervals.
33	Specialize maintenance personnel are provided in the school workshop.
34	The principals are involved in direct control of workshop facilities.
35	Workshop equipment and tools are kept solely under the care of the teaching staff.
36	Proper records keeping of all workshop facilities of all workshop facilities are carried out.
37	Racks are provided for storage of wood, metal plates etc in the workshop.
38	Materials in the workshop are stored according to their characteristics.
39	Materials in the workshop are stored according to their sizes.
40	Materials in the workshop are stored according to their similarities.
41	Tools in the workshop are kept in the tool crib/room.
42	Tools in the workshop are kept in the tool cabinet.
43	Bench tool storage facilities are provided in the school workshop.
44	The inventory system is effective.
45	The equipment and materials are kept solely under the care of the storekeeper.