

**IMPROVING TECHNICAL SKILLS GAP OF MECHANICAL
TECHNICIAN TRAINEES IN THE FITTER MACHINIST
SECTION: A CASE OF JINJA VOCATIONAL TRAINING
INSTITUTE**

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THE AWARD OF A DEGREE OF MASTER IN VOCATIONAL
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DECLARATION

I, Patrick Mugombesya Salanjaye James, do declare that this is my original work and that it has not been published and submitted to any institution for any award.

Signature.....

Date.....

APPROVAL

This Action research dissertation “Improving Technical Skills gap of Mechanical Technician Trainees at Jinja Vocational Training Institute” was written under our supervision. It has been submitted to the graduate school for examination with our approval as the student’s supervisors.

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2. Mr. Edwin WathumDate.....

DEDICATION

This Dissertation is duly dedicated to **The Salanjaye Family** which is the source of my existence, and also planted into me the seed of education which has metamorphosed into this fruit. Dedication also goes to my family: my dear wife Jane, our biological fruits; Audrey, {Albert-Annet} Gloria, Reeves, Vivian and all my grandchildren - Anabel, Adriel, Gracious, Eberone, Janelle, Catherine, Curtis, Peace and Joy who stood with me through the struggle up to the end.

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ABBREVIATIONS/ACRONYMS

ADB	African Development Bank
BTVET	Business Technical Vocational Education and Training
FGD	Focus Group Discussion
FM	Fitter Machinist
IDA	International Development Agency
IT	Information Technology
JVTI	Jinja Vocational Training Institute
KyU	Kyambogo University
MECP	Mechanical Engineering Craft Practice
MMF	Metal Machining and Fitting
MVP	Masters Vocational Pedagogy
NBTE	National Board for Technical Education
NCDC	National Curriculum Development Centre
NVTI	Nakawa Vocational Training Institute
TVET	Technical Vocational Education and Training
UBTEB	Uganda Business Technical Education Board
VP	Vocational Pedagogy
VET	Vocational Education and Training
WOW	World of Work

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ABSTRACT

The study was conducted at Jinja Vocational Training Institute, one of the public institutions in the country, established to empower graduates with employable skills and competences relevant to labour market. The purpose of the study was to investigate how to improve the technical skills gap of mechanical technician trainees in the fitter machinist section. The study was guided by four objectives: To establish the gaps hindering practical skills acquisition in the fitter machinist section at Jinja Vocational Training Institute; identify measures of addressing the gaps hindering practical skills acquisition in the section; implement the measures identified to improve practical skills acquisition and, evaluate the identified measures put in place to improve practical skills acquisition. To realize these objectives, an action research study was conducted at the institute with the stake holders who were predominantly trainees from the fitter machinist section. The research design was descriptive in nature. Action research was preferred because it involved the critical stages of planning, observing, acting and evaluation of every cycle. A sample size of five participants was purposively selected to conduct the study. Data was collected through interviews, focus group discussions, future workshop and, observations using tools like manila paper, log forms and a camera to record data. An evaluation was carried out through questionnaires and observations which revealed that the implementation conducted during the study was appropriate because it yielded the expected results; training facilities are now available for effective skills transfer. Thereafter, recommendations were made towards better improvement of the training and learning processes in the institute in general and practical skills acquisition in particular.

Key words: Competences, Skills-transfer, Fitter machinist, Facilities, Skills gap

CHAPTER ONE: INTRODUCTION

1.0 Overview

In this chapter, I define the terms Vocational Education Training and Pedagogy from the fitter machinists' point of view. A background to the study, situation analysis, personal motivation, purpose, objectives, justification significance and scope of the study are also elaborated

1.1 Vocational Education Training - Historical background

The second international congress on technical and vocational education (TVET) in Seoul adopted the term "TVET" at the 30th session of the General Conference of UNESCO in Paris. They agreed on a definition of the term TVET to be the process of combining education and training in a way that acknowledges the common objective for employment as the primary goal. It involves multi-domains that require approaches involving integration and collaboration. It was also adopted that the programs in TVET should be comprehensive and inclusive, accommodating and gender balanced (Hiebert & Borgen 2002). TVET is that aspect of an educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, and understanding and, knowledge relating to occupation in various sectors of economic life (UNESCO, 2011). From history, various terms have been used to describe elements of the field that are now conceived as comprising TVET, and these include: Apprenticeship Training (AT), Vocational Education (VE), Technical Education (TE), Technical Vocational Education (TVE), Occupational Education (OE), Vocational Education and Training (VET), Professional and Vocational Education (PVE), Career and Technical Education (CTE), and Workforce Education (WE). TVET refers to education and training that prepare people for gainful employment (UNESCO 2011).

From a personal point of view, Vocational Education is a training process which focuses on delivery of knowledge, skills and attitude required for a specified interest. It prepares one for work, develops skills while at work and, equips one with positive attitude towards work. For instance, while serving as an instructor at

Nakawa VTI a Japanese expert put emphasis on the mode of training thus: Practicals-75%, theory-25% and, attitude-infinity. It is the duty of the instructor to ensure that attitude is fully embedded during the training process so that the trainee is able to appreciate it at the end. Vocational education has a major and significant role to play in changing a country's status from being a consumer of finished products to producers of finished products for export, to enable these nations compete in the global market for the purpose of economic growth. Vocational education is, therefore, a basis for human capital development, a potential for sustainable and economic development of a nation. In my opinion, this statement is true, a person equipped with technological literacy is capable of sustaining life and so is said to be self-reliant, and if more people are given the opportunity to undertake technical education, they can transform the economy of the country such that all citizens can access the basic services with ease. The primary outcome of vocational education is expertise, being able to do skilful things of a kind and in an area of work that is quite clearly specified and understood.

In Uganda, BTVET department takes the mantle to ensure that VET takes root through the BTVET Act 2008. In 2014, the Government launched "Skilling Uganda" through the BTVET strategic plan 2011-2020 which aims at increasing both the quality of skills provision, and equitable access to skills development. All this was to promote VET and upgrade the economy in general, improve individual incomes through easy employment and sustain life. Apart from that, new institutions have been established in different parts of the country to attract as many candidates as possible to train in various skills. Much as the act is under implementation, VET has not taken deep ground to benefit the citizens because of different issues which may be political, financial, and cultural and also, the negative attitude towards vocational education as exhibited from the colonial era that technical education is meant for academic failures. The National Board for Technical Education (NBTE, 2011), reported that the challenges of TVET sector include; low societal recognition, which translate to low enrollment and inadequate skilled workforce, obsolete instructional facility, inadequate funding,

poor staffing, poor linkages with industry and general deficiency in quality. VET is expected to be implemented at a rate of 80% practical and 20% vocational theory. This is emphasized by Kombe (2010) when he affirms that Technical and Vocational Education and Training prepares people for the world of work and points out that in contrast to general education, learning in TVET is centred on ‘applied’ as opposed to ‘academic’; practical as opposed to theory, and skills as opposed to knowledge. This argument underscores the importance of training materials in VET; they enhance the process of imparting practical skills to the trainees. While undergoing training way back in the seventies, we were exposed to all kinds of practical operations and we were able to excel because we had training materials throughout the training period. It was not surprising that many of us were recruited before completing our courses. Equipment and tools are both obsolete and inadequate as compared to the number of trainees in a class. This is cause for sending incompetent technicians in the world of work. The main objective of VET is to impart practical skills unto the learners. The acquisition of relevant skills can only be acquired in a functional workshop stocked with relevant equipment and facilities. And these include Lathe, Drilling, Shaping and Milling machines (see figures).



Fig. 1 A lathe machine



Fig. 2 A shaping machine



Fig. 3 A milling machine

Kpanep (2011) posited that quality technical vocational education facilities assure learners' competency in practical knowledge, skill and mastery of their chosen career which finally will translate into technological education development. And this is the exodus of my theme for this study. To improve the

technical skills gap of mechanical technician trainees in the fitter machinist section at Jinja VTI. In the seventies, admission was fairly balanced, the number of students was commensurate with the number of facilities/machines in the workshop. During practice, each trainee was allocated a machine while those dealing with bench work had enough tools on them. This gave us the impetus to master the different skills while performing a variety of operations on the given tasks. And Akpan (2000) confirms the argument, thus: Lack of equipment and workshop tools makes it impossible for students to receive training that meets the standards for employment in industries or related organizations.

Traditionally, TVE is a form of education which involves technology, applied sciences, agriculture, business studies and visual arts (Boateng, 2012). Just like indigenous education was practiced direct on the job – apprenticeship; this system helped to sustain the trend of skills transfer from one generation to another. The learning process was by doing meaning that the learners were most of the time with the “teachers” and these were mainly elders and other specialists. Like (Okello, 2009 p. 5) points out that the learning method was that of apprenticeship where the learner made keen observation of the teacher while a demonstration was on. This emphasizes the importance attached to skills transfer to promote life-long learning.

1.1.1 Vocational Pedagogy

According to the research paper by Cedefop (2015) this term has different meanings as derived from different countries which reflect different educational traditions and influences. In Slovenia, vocational pedagogy is defined as a pedagogical discipline that deals with the wider issues of VET like organization, principles, and financing of VET, cooperation between the world of work and education (Musark 2004). In Sweden, (Johansson et al, 2007) refers to VP as ‘didactics’ which comprise planning, execution, and evaluation of teaching and learning methods. From another perspective, VP is defined as a field of knowledge oriented towards trades, occupations and, professions and it involves training and learning to work (Namuli 2002). Personally, I perceive VP as a

program that is geared towards work based learning in crafts, trades and other occupations.

All in all, these definitions all point to common areas like teaching and learning using specific approaches such as presentation, group discussion, role play, or demonstration. Since VET is practically oriented, the pedagogical approach to it must be work based to give the learner the opportunity to learn using his/her entire body and the different senses. This can be by watching, touching and seizing. The significance is that Vocational Pedagogy is guided by a constructivist learning theory since it is action-oriented as opposed to theory and quality of knowledge often associated with cognitive learning theory. Vygotsky's theory of constructivism is in line with VP as it supports the use of activity mediators; a way in which people are able to interact with the environment. As learners acquire new experiences or cognitive constructivism, they are able to explain them as they understand them. This theory according to Piaget (1972) guides learners to interact with their environment and integrate new knowledge and information into the existing knowledge. As expertise and confidence grow, so does the learners' ability to notice what is going on in their own work and in the activities of those around them.

Lee Shulman (2005) refers to VP as 'signature pedagogies' meaning the types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions. Signature pedagogies form habits of the mind, habits of the hand and habits of the heart. In other words, VP is the science, art, and craft of teaching and, learning vocational education. In brief VP points at the methodology used to put knowledge and skill into a learner to an extent that the learner will be able to use the skill outside the learning environment. The question is - What methods do we apply in our training sessions? Quite often, theory lecture approaches are commonly used, but this has always left learners with little or no impact. VE as Shulman (2005) states, must employ the mind, the hand and the heart literally meaning that it is practical based. My experience is that I have been using theory initially followed by a task; but theory at times takes long in the class room such that by the time we move to the workshop, there is an apparent

vacuum – the learner may not easily link theory with the practice. Many instructors take centre stage while teaching and this is the norm in almost all VET institutions. The reason could be due to the system of education which is examination-oriented. Afeti (2006) stated that, the quality of training in TVE institutions in Nigeria is low with undue emphasis on theory and certification rather than on skills acquisition and proficiency testing. Instructors tend to emphasize theory at the expense of practice. With the knowledge about VP, I have come to appreciate that learning can be demystified when learners are given the opportunity to direct the learning process. This can be through any of the methods which promote learners' active participation, like demonstration, case study, field trip, and many others. There will be more interaction amongst the learners, leading to deeper internalization. There are also arguments for handling theory and practice as interwoven, in order to learn wholeness (Bjurulf & Kilbrink, 2008). And by using a VP approach, the learner is left to control the learning process and this gives him/her the opportunity to discover, meditate and deduce solutions.

1.2 Personal Background

I pursued my Technical Education at Uganda Technical College (Elgon Technical Institute) where I trained as a Fitter Machinist or a Mechanical technician for two years after my secondary education (1974-76). On completion of the course, I went into the world of work where I served with a Government parastatal dealing with produce processing and export. In the field, I worked as a Maintenance technician and Section Manager respectively for sixteen years 1976-92. Due to economic and administrative factors, the organization closed some of its centres and much of the work force was retrenched. And I was a victim. I joined Kyambogo University – Uganda Polytechnic by then (1996) where I trained as a Technical teacher, and thereafter, I served as Work shop technician at Uganda Polytechnic Kyambogo in the Mechanical workshop and as a part time lecturer (1997-99). I was recruited by Nakawa Vocational Training Institute. Initially as a part time instructor in 1999, promoted to instructor in 2007 later on to Chief Instructor in 2008. My experience at NVTI was that most of the staff there were

untrained teachers. Nonetheless, the Japanese experts ensured that during holidays, the entire teaching staff were grilled through the various methodology approaches to keep them abreast. My training put me at the frontline in spearheading the teaching methods especially when it came to Vocational pedagogy. I was given a scholarship to Japan 2001-2002 to get further training in Machine technology and pedagogy skills. I completed the training in March 2002 and returned home. September 2002 I joined Kyambogo University and pursued a four year bachelors' program in Technical Teacher Education. I completed the program in 2006, graduated in February 2007 and continued to serve at NVTI up to the end of 2012 when I got a transfer to Jinja Vocational Training Institute where I am serving in the capacity of a Chief Instructor. In August 2015, I joined Kyambogo University to pursue a Masters' in Vocational Pedagogy. Through this program, I have acquired the pedagogical skills relevant for my profession as an instructor and I have also developed other skills which I can ably apply at different fora; like conducting basic in-depth action research in vocational fields; designing and producing VET curricula; facilitating at any vocational institution and liaising between the world of work and TVET.

1.2.1 Background of the study

Jinja Vocational Training Institute (JVTI) was established in 1982 by the Government of Uganda in Collaboration with the World Bank under the 2nd International Development Agency (IDA II Education Project) to offer vocational skills to workers in industries. The Institute is supervised by the Business Technical Vocational Education and Training (BTVET) department of the Ministry of Education and Sports. It is located on the eastern side of the town commonly known as Factory village, Walukuba West parish, Jinja District. The primary objective of JVTI is to develop capabilities, attitudes and abilities of individuals by providing them with employable skills and competences relevant to the labour market. The skills and competences acquired by trainees provide opportunities for progression in pursuit of professional development in their respective trades. The institution implements six specific objectives: impart knowledge, Skills, and attitudes to learners and prepare them for the world of

work; provide for continuing education and training for skills upgrading and re-training in light of rapid changes in the labour market; train instructors in methodology and soft skills before posting them to private and public vocational training institutions; promote participation of women and disadvantaged persons in vocational training and enterprise development; render technical and professional services which are not readily available in the community by supporting appropriate technology endeavours; promote entrepreneurship training integrated within the curriculum to enable persons in possession of technical qualifications manage their own resources.

The area of interest in this study was to improve the technical skills gap of mechanical technicians in the section. But the section is poorly equipped; three lathe machines, three milling machines, two drilling machines, one old shaping machine and no surface grinder against forty-three trainees yearning to acquire practical skills needed in the world of work. This scenario is quite demotivating as far as skills acquisition is concerned for both the instructors and the trainees. The whole process drags on for a long time and some trainees give up after waiting endlessly. At the end of it all, the rate of skills acquisition is very low as compared with other institutions which are well equipped. From a personal experience, when I was training, we had adequate machines and each trainee would dominate a machine tool till all operations were done. The trainees had ample time to master both the machine and the skills and consequently the results were encouraging, no wonder, there was a scramble for technicians by then. MVP advocates for a balanced process, where practicum and theory are given equal opportunities, but the situation on the ground does not favor and this is a reason many incompetent graduates are passed out annually.

The present situation where we have less equipment and tools against forty-three trainees does not enhance skills acquisition. This instead acts as a deterrent to skills acquisition. The big number of trainees in the class contradicts the policy of Competence Based Education and Training (CBET). The workshop gets congested such that effective training is grossly hampered, there is no healthy working environment, a fertile ground for accidents. Even classrooms get full to

capacity making it pretty difficult for the instructor to move freely during the time of deliberating. Bear in mind these classrooms were designed for fifteen students on average compared to the current number of forty-five students in a class. Unlike in the past where admissions were based on the infrastructure in place, for instance, at the time I trained we were strictly ten in class, the state of affairs today is the opposite where admission is carried out nearly through the term. It is not surprising to see new trainees reporting during term two. The other area of concern normally emphasized during training is accuracy. During workshop practice, instructors demonstrate all the techniques involved in producing articles to standards. In an environment where tools are in short supply, and trainees have to share, it becomes difficult for one to produce an item to standard in a given time. Ideally, a trainee needs to have the tools freely disposed to him/her so as to practice without any interference from a colleague who may be standing by waiting for the same tool. And Akpan M. P. (2000) confirms the argument with the remark: Lack of equipment and workshop tools makes it impossible for the students to receive training that meets the standards for employment in industries or related organizations. In the world of work where profit is the target, employers do not accept substandard work. For this reason, the author and the colleagues in conjunction with the workshop assistants play a major role in ensuring that trainees carry out their practical sessions following the specifications set. This is to emphasize the importance of precision work. As a professional instructor, the researcher has established that relationship between trainers and trainees which motivates trainees to interact freely and seek guidance from instructors whenever they are in need. This is done in a bid to ensure that trainees acquire the practical skills in spite of the inadequacy of equipment and tools. Very often, trainees practice their skills in the work shop through the normal training periods reflected on the time tables and sometimes they handle customers' jobs under the supervision of the instructors or work shop assistants.

The big population of trainees makes it difficult to conduct effective practical training within the allocated time, many of them do not practice exhaustively. This training is allocated one day in a week while theory lessons occupy the four

days. This time is too little for forty-three trainees to master skills with the limited machines in the work shop. As compared to our times, work shop practice was allocated sixteen hours per week, those are two full days of eight hours each. All trainees could be kept fully engaged while in the work shop, there were times we didn't wish to leave the work shop because we were highly motivated. Gobet, and Campitelli (2011) emphasize that deliberate practice is a key factor as far as acquiring expertise is concerned. They further reason that deliberate practice occurs when an individual intentionally repeats an activity in order to improve performance; and they pine that such behavior is necessary in order to achieve high levels of expert performance. All these arguments rotate around the aspect of time, for one to acquire expertise, there is need to dedicate more time for more practice. And Boulet G. (2016) emphasizes: to prepare an individual to meet the desired performance s/he does not need lectures instead s/he needs more practice. And the more the practice, the more expertise one acquires. This status quo drew my concern with regards to skills acquisition as a core necessity in the training of mechanical technicians in the section. And this is when I decided to organize means and ways of meeting the stake holders and forge a way forward; which gradually culminated into a situational analysis.

1.3 Situational analysis

Since the study was about improving the technical skills gap in the section, the researcher opted to meet the stake holders – Administration, Instructors, and trainees - at different fora in a bid to collect the required information. Focus group discussions were conducted, while other stake holders were met on a one on one basis and class assemblies were also organized. After collecting and compiling data from the various stake holders, the researcher organized a general meeting where the critical issues were analyzed. The meeting -future workshop - was called and all the stakeholders were invited. The author outlined the regulations to be followed during the meeting and requested everybody to actively contribute so as to get as many ideas as possible for the benefit of all stake holders. The results

from the situation analysis (challenges) were written on the chalk board for everybody to see. (See appendix I)



Fig. 4 future workshop in progress



Fig. 5 voice recording during the workshop

A democratic process was carried out to choose the critical challenge and the results were as follows: Equipment & tools 26 votes; Training 3 votes; Training materials 3 votes; Infrastructure 0 votes and Administration 0 votes. The results were further scrutinized and it was observed that training and training materials are related and so the two were merged leaving only four categories namely, i) Equipment & tools, ii) Training and training materials, iii) Infrastructure, and iv) Administration. I asked the stake holders to critically look at the four challenges

and chose one which we could ably handle in the shortest time with minimum resources. This eventually led to that category of Equipment & tools; where the number of machines is less in comparison with the student population. And yet this is a major component as far as practical skills acquisition is concerned. To ensure validity and reliability of the chosen challenge - equipment and tools - the four categories were also subjected to a pair wise ranking system to ascertain that the challenge voted by the stake holders is the appropriate one. (See appendices II & III)



Fig 6 last phase of future workshop



Fig 7 Group photo after future workshop

1.4 Statement of motivation

The training/learning process at JVTI was noted to be slowing down especially the practical part of it. When a practical assignment was given, there was a tendency for it to drag on for such a long time to an extent that some trainees lost interest and almost gave up altogether. Those who persisted and handed in, the performance was not encouraging either. This situation was indicative of a potential downward trend in the academic performance. This was the point of departure which motivated the researcher to move a step further and dig deep into the matter so as to get the details and devise a possible remedy.

1.5 Statement of the problem

Throughout the world, and in particular the countries of Sub-Saharan Africa, governments are renewing efforts to promote technical and vocational education and training (TVET) with the belief that skill formation enhances productivity and sustains competitiveness in the global economy.

One of the most important features of TVET, as recognized by African governments, is its orientation towards the world of work because the curriculum puts a lot of emphasis on the acquisition of employable skills.

In Uganda, BTVET is mandated to spear head the training and production of technicians through the various technical institutions. Unfortunately, to date many of the graduates from Technical/Vocational institutions pass out when they are ill-equipped. Jinja VTI is one of the institutions facing the problem. During the future workshop, the stake holders complained about the deteriorating pace of practical training in the section, and warned that if nothing is done in the short time, the performance is likely to be appalling. It is this background which drew my concern and as an instructor, I found it appropriate to carry out an investigation in order to establish the root cause and find a possible solution.

1.6 Purpose of the study

The purpose of the study was to investigate the possible ways of improving the technical skills gaps of mechanical technicians in the Fitter machinist section at JVTI.

1.7 Objectives of the study

- a) Establish the gaps hindering practical skills acquisition in the fitter machinist section at JVTI.
- b) Identify measures of addressing the gaps of practical skills acquisition in the fitter machinist section at JVTI.
- c) Implement the activities identified to improve practical skills acquisition in the fitter machinist section at JVTI.
- d) Evaluate the identified activities put in place to improve practical skills acquisition in the

1.8 Research Questions

- a) What gaps are hindering the skills acquisition in the fitter machinist section at JVTI?
- b) What steps can be taken to address the training skills gaps in FM section at JVTI?
- c) What should be done to improve practical skills acquisition?
- d) How will the effect of the implemented activities be determined?

1.9 Justification of the study

The quality of the services rendered by the fitter mechanists of late has greatly deteriorated as evidenced from the future workshop. JVTI mode of training has been pointed out to be more theoretical than practical hence inadequate exposure of students to hands on training as required. This in the long run will deprive the country of skilled man power needed in the world of work. The researcher

purposed to carry out this study with a view of improving practical skills acquisition to enable the institute produce competent graduates.

1.9.1 Significance of the study

The study revealed that skills acquisition is a positive trend in the training process and, this is a way forward to promoting Vocational Education. The vocational educators therefore, will benefit by getting the skills in research, consequently, the administrators too will benefit; by applying the skills to handle the different problems within their institutions. Kyambogo University as a promoter of the study will remain in the lime light as the champion of action research. (Elliot, cited in Hiim, 2007) asserts that the purpose of educational action research conducted by teachers is to develop knowledge of importance to the teacher, participants in the project, and for the teaching profession. And personally, I have gained more skills in the research field thus adding value to my status as a researcher.

1.10 Scope of study

1.10.1 Geographical scope

The study was conducted at Jinja Vocational Training Institute, which is located in Walukuba west parish, factory village within Jinja municipality, Jinja district. This Institute was chosen because this was my place of work; and so it was convenient for me to carry out the implementation together with the trainees and other stake holders.

1.10.2. Content scope

The content scope of the research was based on the objectives of the study. The first objective was geared towards the challenges hindering the acquisition of skills as experienced by both the trainees and the instructors. Under objective two, suggestions to enhance skills acquisition were discussed. And in the third and fourth objectives, suggested measures and their evaluation were considered.

1.10.3 Time scope

This study was monitored for one year, from November 2016 up to October 2017.

1.11 Definition of key terms

Mechanical technician: this is someone who is trained in bench work and machine technology, s/he has the ability to detect, identify and diagnose faults in factories or industries.

Technical skills: these are abilities and knowledge needed to perform certain tasks, they help mechanical technicians to perform their normal activities of maintenance management, fault finding, or repair work.

Trainee: someone who is undergoing training in a technical field, this is normally practical oriented.

Vocational Education and Training: is a training process which focuses on delivery of knowledge, skills and attitude required for a specified interest.

Vocational Pedagogy: Vocational Pedagogy is a broad term referring to an educational program that is geared towards experiential based development work in crafts, trades, occupations and professions.

Machine tool: is a heavy or non-portable power driven industrial device used for abrading, cutting, drilling, forming, grinding, nibbling, or shaping of a piece of metal or other material.

Skills transfer: a process of learning to perform a task through constant practice.

Fitter: an individual who makes articles using hand tools and eventually assembles them into a unit.

Machinist: a person who specializes in operating different machine tools in a workshop or industry.

CHAPTER TWO: LITERATURE REVIEW

2.0 Overview

This chapter presents the scholarly perspective of the study with a bearing on the four objectives mentioned in chapter one. I do present a brief account of what Technical skills means with reference to a fitter machinist. As a professional instructor in the Fitter Machinist section which churns out Fitter Machinists or Mechanical technicians, I found it necessary to give a broad outline of the two terminologies - Mechanical technician and Technical skills - since they conspicuously appear in the theme.

2.1 Mechanical technician(s)

Broadly speaking, a mechanical technician is someone with the ability to detect, identify and, diagnose faults in factories or industries. S/he can handle different engineering operations like preventive, condition based, predictive and regular maintenance. In large establishments, they do what is called overhaul of plants or factories basing on the time schedule. A mechanical technician specializes in the maintenance, design, layout and performance of machines and equipment. S/he may work on industrial, electrical, manufacturing or transportation equipment. Regardless of area of specialization, s/he is well versed with the operations of machines/equipment; s/he is capable of estimating costs of projects, prepare layouts and drawings of parts, review blueprints or assemble parts and equipment. S/he may also perform tests on finished products, looking for potential improvements or alterations which s/he and the engineer can make. These technicians may be classified as highly skilled workers or at times semi-skilled and may be part of a larger production process. A mechanical technician is a graduate who has undergone training in both bench work and machine technology; s/he is drilled through the various techniques which empower him/her to operate different machines and equipment.

2.2 Technical skills

A technical skill is the ability to carry out a task associated with technical roles like IT, engineering, mechanics, or science. Many of these technical skills require experience and training to master Elias Tzoc, John Millard, (2011). These skills back mechanical technicians in their normal activities of maintenance management, fault finding or repair work; they are practical and often relate to mechanical, IT, mathematical, or scientific tasks. Much as technical skills are important for jobs related to IT, many industries also want employees with technical skills which require training and experience to master. Sometimes they are referred to as hard skills because they can be learned, defined evaluated and measured. The training looks at different subjects like materials, craft science, or applied science, engineering drawing, engineering mathematics, workshop technology and practice. And these skills consist of manipulating different machine tools found in machine shops to cut or shape metal or any other material accordingly. Relatedly, it also involves fabrication and production work which consists of manufacturing spare parts like bolts, shafts, pulleys, bushes to mention but a few.

2.3 The challenges experienced in relation to imparting practical skills

VET is that part of tertiary education and training which provides accredited training in job related and technical skills. The courses are shorter and more practical with a focus on industry and trade related job market. VET covers a wide range of careers and industries, including trade and office work, retail, hospitality and technology. It is also referred to as Career and Technical Education as it can help to develop a particular set of techniques and become proficient in a particular technology (Basnet, 2012). After undergoing a training, the graduate is expected to be skilled to such an extent that s/he should be able to perform a variety of tasks in different work environments and should also be able to plan, execute and process. What is on ground, however, is the reverse; many of the graduates passing out do not perform to the expectation of the world of work. This is the exodus of objective one: Challenges of practical skills acquisition in

the section. These are many and diverse and they are both internal and external. They include inadequate funding, lack of skilled manpower, out dated curriculum, and ill-equipped workshops, inadequate training materials, to mention but a few.

2.3.1 Inadequate funding

Finance is regarded as the blood stream of any project; where funds are not readily available, the project is likely to collapse. In the same vein, VET needs funding so as to keep it burning. An educational system can receive funding from either these: public sector, the private sector or internal community. In our case, public institutions are funded by the Government but the funds are not adequate to facilitate all the activities, somewhat somehow individual institutions have supplemented on this through charging students what is called tuition. This has been approved by the Government although the payment rate is very slow and very often fees defaulters have been sent away. By the end of the day, institutes have remained limping economically with many requirements an attended to (Bathmaker, 2013). Studies show that, in Developing Countries, funding towards TVET is adhoc and arbitral. TVET Institutions have been neglected or overtaken by institutions concentrating on purely academic education without any practical training (On-the-Job Training OJT), (research paper-challenges and priorities in Developing countries). Specifically, things like training materials and facilities require adequate funding to ensure that training is sustained. May (2007) observed that VET is still very much neglected in the aspect of funding, personnel, modern facilities, staff motivation which consequently are robbing the country of the economic development to be contributed by the graduates of Vocational Education. Quite often budgets for VET are minimal and this gives rise to low level employments of trained trainers, assessors and verifiers who play a major role in updating and upgrading their skills. Consequently, inexperienced and unqualified technical teachers are employed thereby lowering academic standard, resulting into wastage of time with regards to achievement of technical education goals (Agbionu, 2003). Modern training methodologies require modern inputs like computers, beamers, printers and many others and all these require funding. Inadequate funding of Vocational technical institutions has often caused a lot of

difficulties in the payment of wages/salaries for those on local pay rolls and many times competent instructors have been forced to search for better paying jobs elsewhere. The impact of inadequate funding is the churning out of half-baked graduates there being no system to build and maintain workshops, laboratories and purchase equipment.

2.3.2 Lack of skilled manpower (instructors)

The quality of teaching and learning in any VET institution is dependent upon the quality and quantity of its teaching staff. These are expected to be both professionals and competent enough to attend to any issues pertaining to VET system. When institutions are manned by instructors with no experience both teaching and industrial, the training is likely to be poor leading to incompetent graduates. According to Ssemwogere (2010), 'quality BTVET training can only be delivered by competent trainers with sufficient technical and practical training. They must exhibit confidence in practical and pedagogical skills commensurate with technologies of the day and befitting the different workplaces'. It is therefore incumbent upon the mother Ministry to ensure that VET instructors are fully trained to impart the required skills unto the graduates. Even individual institutions are expected to plan for their staff under the staff development scheme; this not only plays a motivator role but also gives the individual instructors a sense of belonging and so curtails the rate of turnover within the institution. Bassi (2004) posits that 45% of all Nigerian professionals including technical educators have left the Nigerian shores over the years. VET is practical in nature therefore it demands for highly innovative instructors who will motivate learners practically. Ndomi (2005) says both sectors require the services of well trained and competent personnel who can operate and maintain the available technical equipment and machines. Some instructors have little pedagogical and competence based training while others have little or no industrial experience. Relatedly, many lack the quality in terms of content and methodology to back up the training process. Akombi (2005) cited in Uddin and Agbonghale (2015), states that most vocational institutions administrators are products of general education, which brings about problems in the implementation of vocational

technical education policies. Education International (2009), the career paths in some VET institutions are not clearly defined. For instance, there is lack of upgrading in-service instructors. Institutions on their own cannot recruit, and yet official recruitment is done once or twice in a year; this leaves institutions in total deficiency as far as instructors are concerned. Skilled man power is a key to success as far as skills transfer is concerned. Andersson and Kopson (2015) state that vocational instructors' work is mainly based on two competences: teaching competence and competence related to vocational practice in a specific trade. Teacher confidence is a necessary virtue which enables the teacher to effectively use the learning materials to support innovation in pedagogy. As teachers become more confident and experienced, they change their teaching styles; they shorten the speeches at the blackboard and give students more room without losing authority Cedefop (2015). Another factor related to unskilled instructors is the training institutions or instructors' college(s); these too are not fully equipped to give the trainees that tangible knowledge and experience needed. The trainers themselves don't have the confidence to inspire their trainees, the required materials are not readily available to enhance effective training. And at the end of the stipulated period, they have to pass out and go into the field as 'qualified' instructors. Theory lessons are bound to dominate the training because the trainer never received any practical lessons in the course his/her training. Furthermore, Nwogu and Nwanoruo (2011) are of the view that the constraints facing vocational education for quality vocational skills development include: lack of skilled manpower, acute shortage of vocational educators, inadequate training facilities and equipment. In the same vein, Uwaifo and Uwaifo (2009), stated that the problems of vocational education in Nigeria include: inadequate physical/material resources, poor administration, poor training and retraining program for vocational educators. With the policy of Competence Based Education and Training (CBET) being adopted by VET, it is still a long way to come to terms with the reality, as CBET means integrating lessons with relevant practical skills. CBET also focuses on development of skills, knowledge and attitude required to achieve competence standards.

2.3.3 Poorly equipped workshops

This challenge is quite critical, because currently the workshop barely has a minimum of all the required machine tools to effect positive practical skills acquisition. Three lathe machines, one obsolete shaping machine, one drilling machine, and no grinding machines both surface and cylindrical. In such an environment, the process of skills acquisition is highly hampered more so when the population of trainees is far bigger than even the original capacity. Fafunwa (Ogundu, 2009) affirmed that what Africa needs today and indeed Nigeria is the problem solving and critical thinking approach that can be developed with the use of functional equipment in the workshop. Lack of equipment and workshop tools makes it impossible for learners to receive training that meets the standards of employment in industries or related organizations. This statement confirms what the world of work has always echoed that majority of the graduates passing out are incompetent. Ayonmike (2014), posited that tools and machines are in short supply, obsolete, and non-functional and cannot meet the facility requirements of vocational education programs. Without functional workshop tools and equipment, the technical teacher is grossly handicapped s/he cannot demonstrate any skill. TVE has theory limit, if the teaching and learning exceed that limit, acquisition of skill is hampered and TVE will become “theoretical education.” And this kind of training implies that TVE graduates are sufficiently deficient in practicum hence are unable to satisfy the industrial demands. Afeti (2007) stated that, the quality of training in TVE institutions in Nigeria is low with undue emphasis on theory and certification rather than on skills acquisition and proficiency testing. Technical and Vocational institutions require workshops, tools, equipment, and materials for demonstration and practical works.

2.3.4 Out-dated curriculum

International Labour Organization (2000) emphasizes that education and employment must have a direct relationship. This means that VET and the world of work have to collaborate in order to ensure that they are moving in the same direction. This move is likely to usher in a balanced curriculum developed by the

two parties and this will keep the training in line with the requirements of the industry. What is happening in most of the institutions is that they strictly follow a given curriculum and because the training is examination based, they must abide. The curriculum actually dictates the teacher's approach to teaching; he/she will concentrate on knowledge education at the expense of skills training. Consequently, the learner is equally compelled to resort to reading in preparation for examinations in order to excel. This type of training makes the best learners alien to the occupational practices when they complete the training. Lamsal (2012) says the training curricula are so rigid and not regularly updated as per the dynamic technology trends. The centralized management system does not allow an immediate response to the emerging local human resource needs; and it also restricts introduction of new programs or updating the old ones. This scenario tends to create a gap between VET and the industry as there is no coordination between the two stake holders to steer the training to suit the labor market. Technical education is characterized with both practical and theory lessons and practice is normally allocated 75% of the total training time while theory takes 25%. Olunloyo (2002) noted that one of the issues confronting the design of appropriate curriculum for technical education is preparing learners for the shift from the fordist to Information Communication Technology (ICT) paradigm in technology practice. This technology practice dictates a paradigm shift with regards to teaching. Learners are expected to take a lead position in the learning process so that they can exploit and explore the environment and the learning process. The quality of VET is dependent on the content of the curriculum, this has to be comprehensive, diverse and up to date; embracing even the demands of the labour market. Links between education and training and the employment sector should be improved through researching the needs and competences that are on demand or will be required in future by the labour market.

2.4 Measures to address the challenges of practical skills acquisition.

There could be a number of measures suggested to put in place in an effort to address the challenges hindering practical skills acquisition. In the lineup, I have mentioned a few which include: coordination between VET and the industry; availability of training materials; equipment and tools and, time for practical training.

2.4.1 Coordination

By coordination, I mean a collaboration between VET and the world of work. This means it is a two-way system; for instance, the world of work guides VET as to what to train about regarding specific skills with reference to what type of technology is at hand. In other words, the two stake holders can develop a balanced curriculum so that the training is geared towards what is on the market. According to Zinser and Lawrenz (2004) VET providers can now get involved with the industry experts, to streamline their curriculum development process and seek out professional development opportunities. This will eliminate training out of context and since the employers are involved, they are at liberty to visit the VET and see or check on the training process and where need arises, they can as well join as counterpart trainers. (ILO 2010), gives priority to increasing access to education and training, making training in public institutions more relevant to work place needs by strengthening coordination and partnerships with private sector, and combining institute-based education and training with enterprise-based learning. This is another sure way of targeting learners with the required skills and on completion of the training, the graduate will be proficient and competent. In an attempt to address these challenges, Reddan and Harrison (2010) argued that TVET institutions need to restructure their programs to be responsive to the needs of the job market, especially the industry. And this can be successfully achieved by ensuring that VET curricula focus on the outcomes in terms of skills, knowledge and attitudes required in the industry. King and McGrath (2004) argued that with TVET being more diverse because of the changes in the labour market, it should be able to integrate the youth into the working world. By so

doing, the process of skills acquisition will be enhanced to the advantage of both the industry and the VET in general and the individual graduate in particular.

2.4.2 Availability of training/instructional materials

According to Eya (2006) instructional materials are all forms of information carriers which can be used to record, store, preserve, transmit, concretize or retrieve information for the purpose of teaching and learning. Similarly, Ogwa (2002), says instructional materials include audio visual aids, tools, equipment, machines, educational materials such as chats and ICT instructional resources. He also said that, instructional aids mean all the materials or teaching aids or material resources which the teacher utilizes for the purpose of making teaching and learning more effective and meaningful to students. In the same sense, instructional facilities for VET encompass all basic hand tools, equipment, classrooms, workshops, and laboratories electric and electronic instruments among others which help the learners to learn properly (Bulama, 2001). Training materials are consumable items used in schools /institutions to compliment learning and training. These vary and may include text books, chalk, garden implements, for those offering agriculture, lubricants, cloth, timber, bricks, metals in form of bars, plates, sheet metal; wires of different gauges to mention but a few. These may be used directly or indirectly in the training process but all in all, they form the core of training as far skills acquisition is concerned. It is through training materials that any trainee can be assessed, it is therefore important and necessary that training materials are always available for effective training and enhancement of mastery. The major problem facing vocational and technical education includes inadequate quantities of equipment, machines, tools and instructional materials (Osuala, 2004). In a similar vein, Kombe (2010) emphasizes that Technical and Vocational Education and Training prepares people for the world of work and pointed out that in contrast to general education, learning in TVET is centred on ‘applied’ as opposed to ‘academic’; practical as opposed to theory, and skills as opposed to knowledge. This is to justify that training materials play a big role as far as skills acquisition is concerned. There is no other possible way of judging a learner in VET without him or her producing

an item or offering a service by demonstrating a skill. This is from a hands-on activity following the given procedures and observing all other precautions like safety, accuracy, and time management. The learning toward greater practice rather than theory is synonymous with technical education, the relevancy and utility of VET lies in the practical application of what is taught. Ubong and Oguzor (2007) assert that teachers, curricula and schools offering vocational education have to emphasize the practical aspect of different specialties in technical and vocational education. To achieve all this effectively means that institutes should have a good stock of training materials throughout as this will motivate both the instructor and the learner. In many institutes, training materials is a critical issue, for instance, at my institute requisitions are made early enough at the beginning of the term unfortunately, some times the term may elapse without any stock. In order to acquire proficiency and mastery, learners need constant and regular practice in different skills or operations; and this can be achieved only when training materials are readily available just like the saying goes 'practice makes perfect'. Campitelli & Gobet, (2011) emphasize that deliberate practice is a key factor as far as acquiring expertise is concerned. They further reason that deliberate practice occurs when an individual intentionally repeats an activity in order to improve performance; and they pine that such behavior is necessary in order to achieve high levels of expert performance. And expert performance will be attained only when training materials are in place.

2.4.3 Adequate equipment and tools

These are items like machine tools of different types; fitters' benches, bench vices, and hand tools which include files, chisels, hacksaws, calipers, taps, punches, scribes, still rules and many more. These equipment/tools are part and parcel of practical training. They are the 'road' to skills acquisition in any capacity. Once they are missing in any workshop, it is a disaster to training. The equipment need to be relevant, of good quality and, adequate to sustain the training. The main objective of VET is to impart skills unto the learners and these are practical in nature. The acquisition of relevant skills can only be effected through a functional workshop stocked with relevant equipment and facilities. A

visit to a machine shop in any institution will reveal the appalling status quo. Basic infrastructure is disturbingly lacking; workshops are either empty or stocked with obsolete machines. Where equipment are present, most of them have either broken down due to lack of maintenance or completely out of use. This scenario ought to change in order to create an enabling environment which will enhance the improvement the technical skills gap. Kpanep (2011) posited that quality of technical vocational education facilities assure student/learners' competency in practical knowledge, skill and mastery of their chosen career which finally will translate into technological education development. A fully trained technician has the capacity to manipulate all the equipment in the machine shop and this virtue puts him/her in the limelight as a competent machinist who can produce/fabricate an item to set standards. Bybee & Loucks-Horsely, (2000) emphasize that student's practical projects are an important part of the curriculum in TVE, but a supportive school environment is a fundamental requirement for the successful implementation of the curriculum. According to Olabiyi, et al, (2008) many educators are of the view that learning occurs best through participation. The use of training facilities helps teachers to direct the learning of their students instead of talking from higher platform to passive students, some of who might be asleep. I concur with the author because when one is practically involved in an activity the learning becomes concrete for the mind, heart and body are actively and collectively functioning.

2.4.4 More time for practical lessons

From a practical point of view and from experience, practical training requires a lot more time than theory. At Nakawa VTI for instance, under the supervision of Japanese experts, practical training was allocated more time 75% while theory was allocated 25%. This arrangement proved very effective and by the end of the training, the institute performed very well, especially in skills acquisition. In the same vein, I would argue the entire VET to move alongside the wind of change and adopt the paradigm shift where skill acquisition is given top priority. Looking at the trend today, practice and theory are allocated the same time that is 50% each. At my institute, workshop practice is attended once in a week out of the five

days. With other factors taken into account, this time is too short for each individual trainee to have real hands-on skills transfer. The class is bigger and yet the equipment are fewer compared to the trainee population all this leads to incomplete training with no skills acquired apparently. Guy Boulet (2015) says to prepare an individual to meet desired performance s/he does not need lectures instead s/he needs more practice. I concur with the argument to have more practice; this is because more practice naturally means more chances of skill acquisition. I wish to refer to the time of my training some years back, we were ten students divided into two groups; each group would practice for two days in a week. This timing was adequate; we were able to finish the assignments in time. We had ample time to practice and master the skills, no wonder some of us were recruited before completing the course. We were competent enough to serve the world of work effectively. It is therefore necessary to allocate more time may be sixteen hours so that the class can be divided into two groups to ensure that every one is given the opportunity to participate. Campitelli & Gobet, (2011) emphasize that deliberate practice is a key factor as far as acquiring expertise is concerned. They further affirm that deliberate practice occurs when an individual intentionally repeats an activity in order to improve performance; and such behavior is necessary in order to achieve high levels of expert performance. All this leads to the aspect of time, because the more the practice, the more time is consumed. Unlike art and science education, Technical and Vocational subjects require more instruction and practice therefore they need to be allotted sufficient time to target the intended goals.

2.5 Implementation

This phase took a bearing towards maintenance/repair and there were three strategies set: Machine maintenance; repairing the old and squeaky benches; and installing the vices firmly unto the benches.

Definition –Maintenance is a combination of actions carried out to retain an item in, or restore it to an acceptable condition (British standard Institute, 2012). With reference to the theme: improving technical skills gap of mechanical technician trainees in the fitter machinist section. The implementation was intended to

improve the existing gap as far as skills acquisition is concerned. The equipment in a functional mechanical workshop are expected to be working effectively at about 85% efficiency; unfortunately, what is the ground is that most of our equipment are about 25-30% efficient and this is a big deterrent to practical training. The way out is maintenance- when carried out professionally and promptly, the status quo will change positively there by improving the efficiency of the equipment.

Owuamanam (2005) observed that the inadequacy of infrastructural facilities and lack of maintenance of available facilities were major problems facing Nigerian educational system. The facilities in schools are grossly inadequate to match the students' population and the available facilities were poorly maintained. The availability and maintenance of school facilities will enhance teaching and learning and improve academic performance of TVE students. Ayua (2006) in a study on consolidating and sustaining industrial performance of school product in TVE for national development revealed some findings on the availability of teaching equipment and material resources thus; there were no standard workshops with adequate facilities in most VET institutions. Fafunwa (Ogundu, 2009) indicated that what Africa needs today and indeed Nigeria is the problem solving and critical thinking approach that can be developed with the use of functional equipment in the workshop.

2.5.1 Repair of the benches

Chapman, (2003) says a rigid work bench is essential as nothing is more aggravating, and conducive to inaccurate work than a bench which wobbles about as one applies force to a job supported on it. One strategy of implementation was to replace the old and worn out top and also reinforce the frame to ensure it is rigid and firm to withstand any forces which come with the operation(s) at hand. A rigid table gives a base for effective demonstration and training, this motivates both teacher and the learner; the latter is challenged to practice and master different skills in relation to bench work and produce items to set specifications. As a trained mechanical technician, and a qualified instructor, I do confirm that no craftsman or fitter can ever come up with an accurate job while working from

a wobbling bench. Besides wobbling, the bench must be intact and firm enough to hold the vices in a fixed position. The top of one bench was replaced with new timber hard and heavy enough to withstand the weight of the vices and any other forces. Crawford S. (1998) asserts that the top of a work bench should be made of heavy hard wood with a thickness of 65 to 75mm. A bench made with quality timber will accommodate various workloads and any one operating on it is assured of safety.

2.5.2 Fixing the vices

Another strategy of implementation was about the vices; nearly all of them were loosely fixed unto the benches using one bolt as opposed to three as designed. Ethically, this is bad engineering practice; for vices are holding devices which must be firmly fixed unto the benches. A vice appropriately fixed onto a bench will motivate a craftsman to perform whatever operation is at hand without fear. And when the work piece is under a tight grip, effective and accurate operations can be administered in a shorter time. A shaky vice on the other hand is bound to cause injury to the craftsman; besides producing substandard work which eventually is likely to result into tool breakage. A rigid bench with a vice firmly fixed will enable the learner to carry out a bench work operation with confidence. Any operation being carried out is effectively manipulated and this compels the trainee to direct all the attention to the practicum going on. The outcome is an accurate component produced, an indicator that practical skills are have been acquired.

2.6 Evaluation

According to Rossi et al (2004) "Evaluation provides answers to questions about a study/program that will be useful or will actually be used – its purpose is to inform action". In the same vein, I carried out a provisional evaluation of the implementation exercise to check the state of equipment just worked upon. I held a meeting with the trainees, discussed the process so far carried out and we tested both the benches and the vices by subjecting them to different exercises - bench work - sawing and filing. All of them performed their operations successfully and

with total satisfaction. The benches were firm and stable while the vices too were firm in their positions.

2.7 Experiential learning theory

From a traditional concept, learning is a process where a teacher stands in front of a class and begins talking to students who are seated attentively listening to him/her. In the actual sense, he is teaching and the students are assumed to be learning. After a while or at the end of the lesson, the teacher then poses questions and naturally students are expected to answer back the very information they were given. At the end we conclude learning has taken place using the theory of learning by memory. This is what Freire (1993 p. 72) referred to as the banking theory of education:

'Education thus becomes an act of depositing, in which the students are the depositories and the teacher is the depositor. Instead of communicating, the teacher issues communiques and makes deposits which the students patiently receive, memorize, and repeat. This is the "banking" concept of education, in which the scope of action allowed to the students extends only as far as receiving, filing, and storing the deposits.'

The assumption was that students are totally ignorant and so when the teacher stands in front and begins talking almost nonstop, he/she is telling them breaking news. The trend is changing swiftly through a paradigm shift where the teacher is not the controller of the class but the learner. This is an argument which was spear headed by John Dewey an American philosopher who advocated for progressive education through experiential learning theory - learning by doing. The theory enhances students' experiences in a learning environment, which may be a classroom, a laboratory or workshop. It encourages students to participate actively and develop personal interest in the lessons there by becoming lifelong learners. While in the industry, I had an experience which made me an 'expert' of some kind. A motor driving a vertical conveyor responsible for scooping produce from the pit up into a bin twenty feet above got burnt and stopped working. As a

technician, it was incumbent upon me to bring the motor down; unfortunately, I had no equipment to lower the motor. I was forced to think out of the box. I bought some six ropes locally made and joined them to cover the distance. I climbed up and tied the motor with the ropes; meanwhile three members on the floor held the ropes tightly to protect it from falling. I unbolted the motor and gradually it was lowered up to the floor; but throughout the process, I was too nervous till the motor reached the floor. The experience I went through transformed me into an 'expert' to an extent that when the same motor got burnt again, I was confident enough for I knew what to do. It was an action research project in disguise. That is the value of experiential learning. In the same way VET has embarked on a new policy referred to as CBET where a student is expected to be the key player in the teaching/learning process. A teacher, according to Dewey, (2011) is to play the role of a mentor, guide, or facilitator thus creating learning experiences. Since the core of our training is skills acquisition, it is imperative that the student is given the opportunity to interact with the environment and adopts it to get the required experience. In this case our environment is the workshop where different machine tools are available for the student to engage. Once the teacher gives guidance or demonstrates an operation or skill, the student embraces that interactive experience to practice and finally comes up with an accomplished task. A skill is acquired through experiential learning, as one practices, or observes a demonstration, he/she continues to learn by adding new experiences unto the old. A task successfully accomplished is a positive experience for the student to rely upon in the world of work. This will also encourage him/her to develop interest in the subject matter which will serve as the initial experience. Experiential learning in the long run evolves into other approaches like problem-based learning and inquiry based learning. A scenario is when a student is given a task, many questions will linger in his/her mind; what is to be performed? How is it to be performed? Which machine/tools should I use? Because experiential learning is action based, it means the action to be performed is specifically targeting a particular problem; and the many questions asked above are all inquiries as to how to arrive at a solution. The student's initial experience with workshop and the machine tools there in, compels him/her to explore the

environment through interaction with the teacher/facilitator who will give him/her the opportunity to discover for him/herself and develop as an active and independent learner. Dewey (1997) in his theory states that *experience arises from the interaction of two principles – continuity and interaction*. Meaning that one's present experience is a function of the interaction between one's past experiences and the present situation. This is a two way process the experience may be positive or negative it all depends on the individual nature of human experience. Experiential learning does not occur in isolation, it is a social activity like (Mjelde, 2006) describes it as a process that takes place through activity and collaboration. This is why students most often are divided into groups to perform certain activities by exploring and exploiting their experiences and potentials in a collaborative manner. And the collaboration in the end results into a product. Through the shared experiences, every member plays a role by contributing materially, physically or otherwise and finally learning will have taken place.

CHAPTER THREE: METHODOLOGY

3.0 Overview

This chapter presents the contents imbedded in the methodology which include research design, area of study, selection of subjects, data collecting methods, instruments developed and their application, selection of the sample, procedure of data collection, ethical considerations and, type of data analysis,

3.1 Research approach

In this study, the researcher used a descriptive process because this provides a complete and detailed narrative of the project. It helps to uncover trends in thought and opinions and digs deep into the problem and offers a complete description and analysis of a research subject without limiting the scope of the research and nature of participant's responses (Collins & Hussey, 2003). The type was qualitative because it is appropriate for small samples. Data was in form of words, pictures or objects and this makes it 'rich', time consuming and less able to be generalized. Like (Creswell, 2007) justifies qualitative research, when a problem or issues need to be explored, understand the setting in which participants study the problem, and the need to empower individuals to share their stories, hear their voices and minimize power relations that may exist during the study. I conducted an action research project purposely to sort out the crucial issues within the section. Action research is either research initiated to solve an immediate problem or a reflective process of progressive problem solving led by individuals working with others in teams or as part of a 'community of practice' to improve the way they address issues and solve problems. Descombe (2016, p. 6) writes that an action research strategy's purpose is to solve a particular problem and to produce guidelines for the best practices. The study employed a Participatory Action Research (PAR) approach because the aim was to identify a critical problem. Nolen (2007) noted that action research is viewed as a practical systematic research method which enables teachers to investigate their own teaching and the students' learning. All this is derived from the work process analysis method or future workshop process. The aim was to improve the

technical skills gap of mechanical technician trainees in the fitter machinist section; through a coordinated process with all stakeholders. And these included the trainees, my instructing colleagues and the administrators. In the same vein, Locke, (2013) cited in (Kemmis, 2005) confirms that action research may involve teachers working together to improve their practice through exploring new ways of working with students.

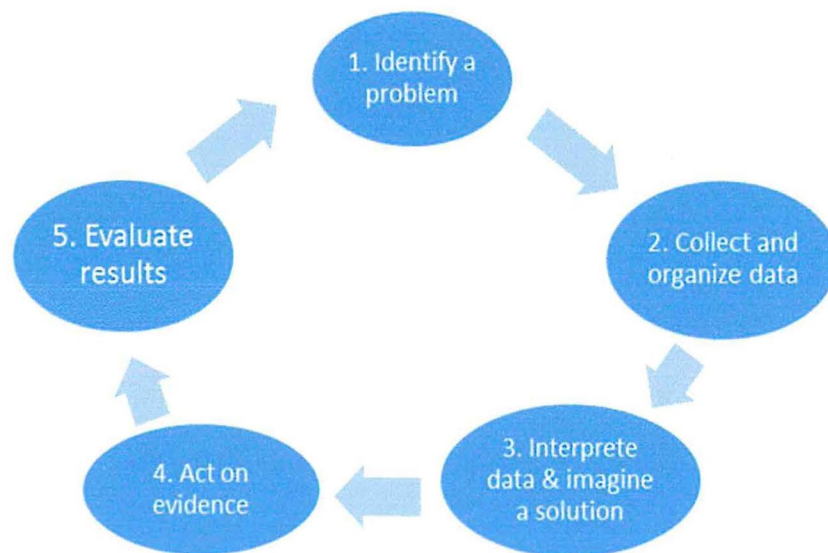
3.2 Implementation of Action production objective

The researcher sought to carry out an action research at his place of work because he felt concerned by the pace at which mechanical technician trainees were getting the skills. The action research had a bearing towards the theme improving technical skills gap for mechanical technicians in the fitter machinist section. The study needed to identify the main problem devise a possible solution, try it out, and finally evaluate it. Vaccarino et al. (2007) refer to action research as a practitioner-based research or self-reflective practice because it involves participants reflecting on their own work. Johnson, A. P. (2007) refers to Action Research. as ‘any systematic inquiry conducted by teacher researchers, Principals, school counsellors, or other stake holders in the teaching and learning environment, to gather information about the ways that their particular schools operate, how they teach, and how well their students learn’.

3.2.1 Actions in the project

In my study, I carried out a situational analysis which involved interacting with the stake holders who included the trainees, the instructors and the administrators. In the process, we identified the challenges encountered during the training specifically practical skills acquisition in the fitter machinist section. Having categorized the various challenges in their respective sets, we agreed to work on the challenges falling within the short term range which at the same time were cost effective. And these were repairing the defective work benches in the workshop and fixing the loose vices. The defective work benches were three; one had a worn out top with cracks, and it was also wobbling. The second was redundant and very unstable; while the third bench had all its vices loosely fixed

and one of its boards constituting the top was loose. This action was in line with the theme of the study - improving technical skills gap for mechanical technicians in the section. In the first instance, we carried out an assessment of all the defects and made a budget for the entire maintenance exercise. I presented the budget to Administration together with the minutes which generated the entire action plan. I did procure the necessary materials which included timber, nails, bolts and nuts and, a half sheet of mild steel plate six millimetres thick. Going by the spiral mode of action plan which has five stages, I went through a complete phase of the cycle. We diagnosed the problem, planned for the activities, implemented the actions, conducted an evaluation of the implemented actions and got the results; all this was based on the five stage action cycle (Carr & Kemmis 1986) as shown in the figure.



Action Research Cycle

Fig. 8 research cycle

Action research being cyclical in nature, it is possible to make changes and adjustments in the next cycle of the research basing on the experience and reflection McNiff and Whitehead, (2009)

3.3 Population

According to Mbesa (2006) population is the entire group of people, events or things of interest the researcher wishes to investigate. The target population of the study was all trainees in the fitter machinist section; administration staff and the instructing staff of JVTI. Nevertheless, only six of them turned up during project implementation and I worked with them throughout. I engaged the second years because they were the main participants in the future workshop and they were directly affected as far as skills acquisition was concerned.

Occasionally my colleague would pop in though very briefly to see what was going on because he had a class he was handling. An administrator would drop in abruptly to observe what was taking place during his supervisory routine.

Table 1 Showing categories of stakeholders

Category	Number
Administration	01
Instructors	01
Trainees	06
Total	08

3.3.1 Sampling technique

The method used in sampling was purposive for each of the categories. This is a process of selecting people or objects from a population in order to test the population or something. (Freedman et al., 2007, Ritchie et al. 2003, Cohen et al. 2007) emphasize that in many cases purposive sampling is used in order to access 'knowledgeable people', i.e. those who have in-depth knowledge about particular issues, maybe by virtue of their professional role, power, access to networks, expertise or experience.

3.3.2 Sample and size

The sample consisted of forty three trainees and one instructor. These took part in the future workshop and they were the ones affected with the challenge of poor skills acquisition. This is the reason the researcher selected them. Initially, nearly all second year trainees showed interest in being part of the study but later majority of them pulled out and I remained with six male trainees only. My colleague in the meantime was on and off as he had a class to teach. This is backed by Creswell (2011) when he affirms that within qualitative research, it is typical to “study a few individuals or a few cases”. Ritchie et al. (2003), suggest that within qualitative research the sample size is usually small primarily because phenomena only need to appear once to be part of the analytical map.

3.4 Methods of data collection

3.4.1. Focus group discussion

This is an informal discussion among selected individuals about specific topics. It aims at using participants’ feelings, perceptions and opinions. The phenomena being researched requires collective discussion in order to understand the circumstances, behavior and opinions. I conducted FGD with two categories of trainees who gave me data relating to the theme. I advised participants to respect each other’s views and contribute freely. Like Finch and Lewis (2003) noted that data are generated by interaction between group participants as they listen to one another. We discussed at length the issues affecting skills transfer and the way forward. Some of the questions raised included:

- What learning experience did you acquire from the study?
- What challenges did you face during the study?
- Suggest areas of improvement for the training.

3.4.2 Interviews

Kvale and Brinkmann (2009) describe an interview as a conversation that has a structure and purpose and involves a careful questioning and listening approach with the purpose of obtaining thoroughly tested knowledge. Interviews allow the discussion to cover the topic(s) in detail if it is conducted informally, and give the researcher the freedom to probe the interviewee to elaborate a new line of inquiry. Berg (2001) treats interviews as “an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasizes the social situatedness of research data.” The researcher conducted interviews with individuals who held specific responsibilities at the institute like the Deputy Principal in charge of training, Dean of students, senior instructors, and Heads of sections who freely and willingly gave their views. The researcher sought formal appointments with each of them so as to get a proper schedule and ample time to allow him conduct the interviews exhaustively. Nevertheless, before conducting the interview, he had to give an account regarding the whole exercise to erase any feelings of suspicion. The interviews were semi structured and this gave the researcher a leeway to chip in questions deemed necessary and relevant during the process. The questions were categorized under specific titles so as to avoid repetitions as same answers would be repeated in different categories. I had a note book where I was recording the answers, it was a tedious exercise for it demanded attention, speed and accuracy.

3.4.3 Observation

This is one way of learning about sensitive issues that participants may be unwilling to talk about. It is preferred because it is possible to collect different types of data as the researcher gets familiar with the site. And it also provides contextual information needed to frame the evaluation and make sense of data collected using other methods. Dewalt and Dewalt (2011), argues that it improves the quality of data collection and interpretation and facilitates the development of new research questions. Observation alone as an activity is not enough to collect

data, it is normally accompanied with a recording activity; where observation takes precedence and recording follows as events unfold. Since I was amidst participants, participant observation was also encouraged. Cohen et al. (2000) comments that observation offers an investigator the opportunity to gather 'live' data from naturally occurring social situations.

3.4.4 Future workshop

This is a method that enables a group people to further synthesize the focus of study when working for example, with social problems. It is an effective tool for data collection. Lauttamaki, (2014) affirms future workshops are a good tool for tackling complex problems where many often seemingly contradicting views have to be fitted together. It involved the main stake holders who had the knowledge of how the system works and they were in a better position to identify the critical issues. All participants worked collectively and decisions were arrived at by all.

3.5 Instruments for data collection

Instruments used included:

Chalkboard - this was used during the future work shop to record and list a inputs and any other ideas from the stakeholders. It is convenient and portable and it keeps all participants in full view of what is taking place. This keeps a free flow system of interaction between the researcher and the participants. They were used to record any input, feedback and, any ideas from the stakeholders during meetings.

Log/note book - this was used for recording data and any other emerging issues in the course of the study. Onwuegbuzie (2010) affirms that a note book is used for recording events, thoughts and observations as they unfold during the progress of a research. It also gives a lee way to note down things in an orderly and chronological manner.

Camera– We took photographs almost at every stage of the study to ensure that we get a report with all details and also help in concretizing data. These played a big role in illustrating the different activities at the various stages. Besides,

photographs are a rich source of data, they help in analyzing and reanalyzing information and they sometimes catch things that are too fast for observers to notice.

3.6 Procedure of data collection

The process started by getting a letter from NOMA- the program coordinator, to the Principal JVTI introducing me as a student of MVP who was intending to conduct an action research study at the Institute. I conducted interviews, held meetings with trainees, staff and administration, in the process, data was collected. Later I conducted a future workshop together with the stake holders, and the mentors; we looked at the major problem and made a deep analysis using the phases of future workshop until we agreed on the selected actions for implementation.

3.6.1 Data analysis

This being a qualitative research, the researcher used qualitative data analysis techniques; recorded all the information as per classification from the responses in the questionnaires. I also used the data recorded in the log notes, and the discussion with the trainees to make a thorough analysis. Like Creswell (2007) argues that qualitative data analysis primarily entails classifying things, persons, events and properties which characterize them.

3.6.2 Validity

This is when data is scrutinized for its worth. And because this research was action oriented, a triangulation process was applied. Data was collected through more than one method to ascertain a rich data bank. From the bank, data was sorted to find similar themes. The different stake holders who volunteered to give data in collaboration with the researcher also uphold credibility of data given. Because a continuous evaluation process through discussion with the stake holders helps to confirm their reflections as well. And Creswell & Miller, (2000) comment that credible data also comes from close collaboration with participants throughout the research process.

3.7 Ethical consideration

The University formally wrote to the institute requesting for permission to allow the researcher conduct a study with them. In the same vein, I approached my colleagues and the trainees at different fora requesting them to be part of the study. It was not compulsory though, and they had the option to attend or not to.

3.8 Limitations

Funds were released a little late which led to delayed kick off of the implementation which consequently led to late completion of the study.

The trainees had other assignments to attend to and many of them did not actively participate in the study. The time for the study was not enough, out of the three strategies planned, only two were implemented.

CHAPTER FOUR: DATA PRESENTATION

4.0 Overview

This chapter presents the study of findings generated during the implementation and evaluation of the study activities. The findings are presented in form of narrative text, and pictures, in addition to observations, interviews and, and discussions held with the stake holders. Questionnaires were also used to get the results and these were categorized in three themes: Availability of training facilities, Attitude and Efficiency. We carried out an action research project with a major intention of improving the skills gap of mechanical technicians in the fitter machinist section. It was imperative that trainees in the section were involved as they constitute the teaching and learning processes. At the completion of every activity or phase, we discussed the activities undertaken thus critiquing ourselves in order to pave a way forward in each case. The narrative observed the objectives of the study as reflected in chapter one:

- Establish the gaps hindering practical skills acquisition in the fitter machinist section at JVTI.
- Identify measures of addressing the gaps hindering practical skills acquisition.
- Implement the activities identified to improve the gaps hindering skills acquisition.
- Evaluate the activities implemented to improve the gaps hindering skills acquisition.

4.1 Choosing the project

Objective one: Establish the gaps hindering practical skills acquisition in the fitter machinist section

During the last meeting of the future workshop, we resolved to handle three strategies; (i) maintaining machines –lathe machine tools, (ii) repairing work benches and (iii) fixing the vices firmly unto the benches. And these were the gaps established. We decided to start with the work benches, these were three in

number and they had different defects. One bench had an old and worn out top, and so could not hold the vices attached effectively. In fact, at times the weight of the vices would cause the tops to partially open up posing danger to the trainees. (See fig. 10).



Fig. 9 Vice loosely fixed with one bolt



Fig. 10 bench with an old top

Besides the worn out top, the entire structure was wobbling, it could not serve the purpose it was designed for. The second work bench was idle for it had no vices attached to it. Besides, it was not rigid enough to support any tangible bench-work operation and, it had no provision for holding the vices. And the third work bench was rigid but with vices loosely fixed. This means that only two benches were in

use because they were the only ones provided with vices, although loosely fixed (fig. 9). In a nut shell, only six trainees out of forty could be occupied with bench work at a time; and their efficiency to cause accuracy during production was highly compromised. This scenario drew our attention and we resolved to put emphasis on bench repair so as to accommodate more trainees. At the time of introducing practical training, bench work practice takes precedence and this is another reason we chose to repair the benches and fix the vices firmly. The vices in question are unique in that they cannot be fixed onto the bench directly from top like the ordinary type; these have two other provisions (lugs) by the sides, a provision for bolting by the edge of the bench (Fig. 11). This design therefore forced us to improvise an attachment - a mild steel plate 100 mm by 60 mm - which would be bolted to the vice initially and subsequently to the bench.



Fig. 11 vice with no bolt in the lug

4.2 Planning for repair work

Since these benches are predominantly wooden, I contacted a carpenter with whom we carried out an assessment and came up with a simple budget. I made a requisition for funds to buy the requirements. I bought the required timber and other materials to kick start the process. The workshop technicians, some willing trainees and I developed a work plan as to how to go about the entire process. And since we were few, we resolved to work on one bench at a time, this was

because of the few tools in stock – spanners. The reason why we were few was the trainees had project work which they had to attend to; more over the time for the project coincided with the time for the study so I had a few of them, five to be precise, who actively participated in the research.

During the planning phase (fig. 12), we outlined all the activities to be carried out and these included: planning and designing the timber and, cutting it to size; clearing the working space; clearing the table of the vices; removing the old top timber; reinforcing the frame work of the bench; replacing the new top timber; marking the mild steel plates and drilling holes into them; marking the positions of the holes on the bench for bolts and drilling them; fixing the vices and bolting them up firmly unto the benches. We started by removing the vices, (fig. 13) and then plucked off the old boards from the bench. At this stage, I asked the trainees to keep record of any activity carried out in their logs.

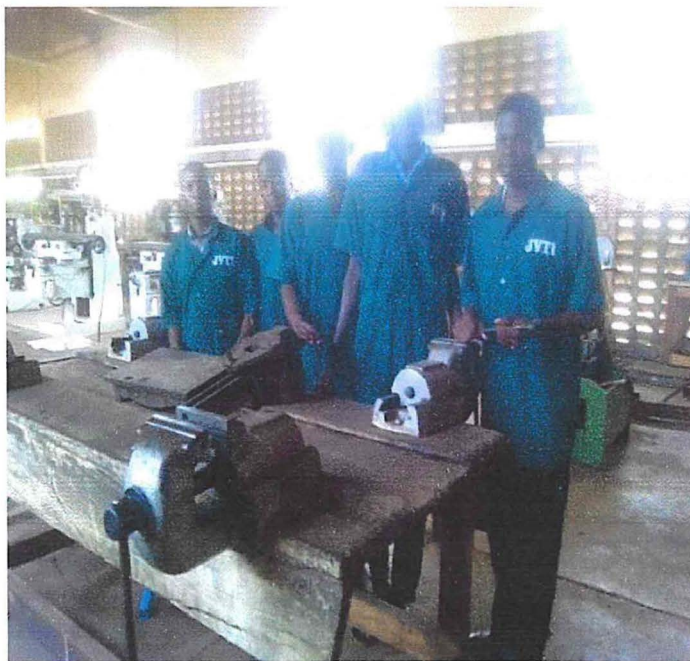


Fig. 12 Trainees planning to implement



Fig. 13 Students & technician removing the vice

When I asked them to fill the log, they were not sure of what to do, even the word log was new to them. I showed them a sample and demonstrated how to fill it. I wanted each one to fill on individual basis but from the facial expressions they were not comfortable. I then suggested that we would use one log as a group but we needed to get a secretary. And so the log was filled twice in a day, at the close of the morning session, before lunch and after the afternoon classes at four o'clock. We all contributed during the time of filling by giving various ideas, observations and, suggestions. After removing the top, we realized that the frame work also had a defect; (fig. 14) the joints were loose because the dowels originally fixed in the joints had become loose and so needed some reinforcement to make it rigid enough. With the help of a carpenter's clamp, we held the frame tight in position and the joints were reinforced with some nails (fig. 15). The exercise roused a lot of curiosity among the trainees; it was another chapter of getting new experiences in a wood sector. They were motivated and this encouraged them to participate actively.



Fig. 14 Frame work



Fig. 15 reinforcing the frame

The procured boards were taken to the wood workshop for planing, where they were also cut to size to match the frame of the bench.



Fig.16 showing the new boards



Fig. 17 Board being measured before cutting

4.2.1 Replacing the top (*phase one*)

We set our targets before the actual implementation and these included: students to actively get involved in the process, cooperate and collaborate throughout the implementation. I also cautioned them to observe safety precautions, record all activities accurately; and finally we had a time limit so we committed ourselves and made sure we accomplished the research as scheduled. The students picked the new boards from the wood work shop to the machine shop to be fitted onto the bench. The carpenter who was the overseer helped in mounting and aligning the boards onto the frame. The design of the top had a 'valley' along for resting tools and so two boards were provided with grooves along the edges. The grooves served the purpose of locking and holding the middle board in position after assembly; and it was a step below the rest thus forming a valley along. And using the clamp, the boards were held in position and then nailed onto the frame. It was observed, however, that the middle board was sagging downwards, thus creating an eye sore. The bench was turned upside down (fig. 18) and the sagging board was aligned by nailing it against the straight boards. This marked the finishing operation for the phase of replacing the top.

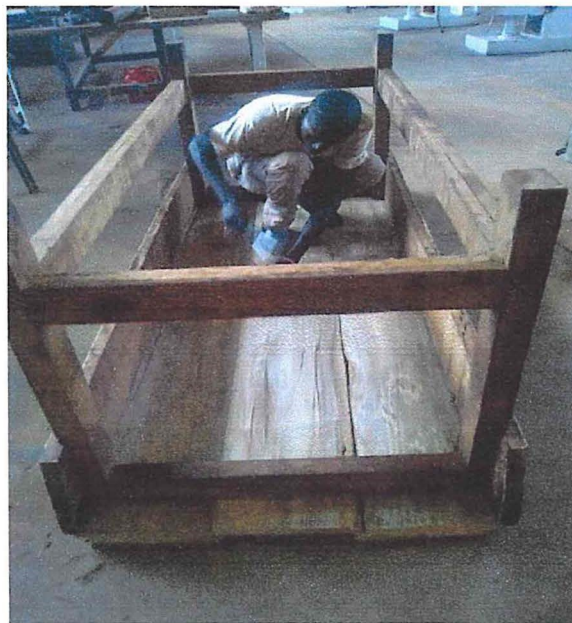


Fig. 18 aligning the middle board

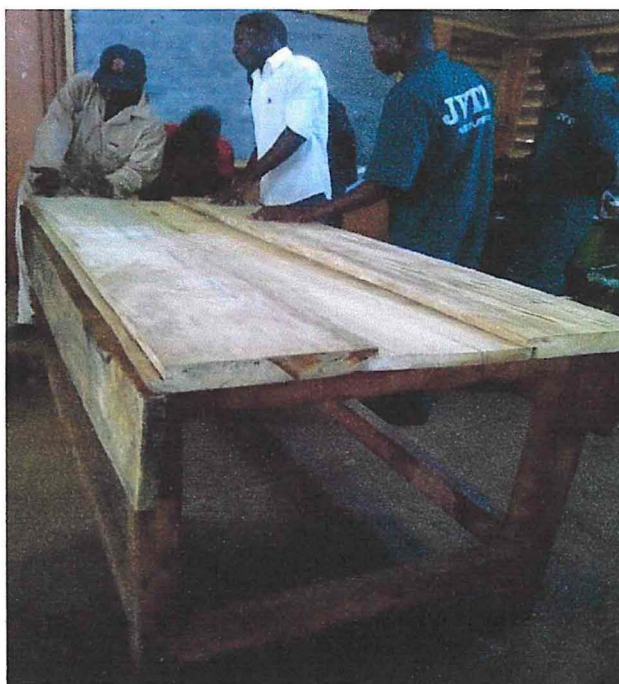


Fig. 19 Bench with a new top

The bench was then turned to its normal standing position. It was indeed smart, with a new profile, heavy and rigid enough to stand any bench work forces (fig. 19). After the phase of replacing the top, we gathered around and had a discussion of the various activities performed in this phase. Among the issues discussed were tools used and their applications, techniques of placing the boards centrally onto the frame and hammering nails into the timber without bending.

4.2.2 Marking and drilling (*phase two*)

The bench was to have four vices fixed, two on one side and two on the opposite side. We marked the positions of the four vices making sure that they are appropriately spaced to avoid congestion. Congestion according to Chapman (2001) is likely to cause accidents in the shop, as this violates the safety regulations of workshop practice. Marking is a very important operation in engineering, any mishap will result into non-alignment of the holes drilled with those on the vice. And since we are yearning for skill acquisition, it is important that the exercise is handled with precision. The marked positions were then drilled three holes – a provision for bolting purposes.

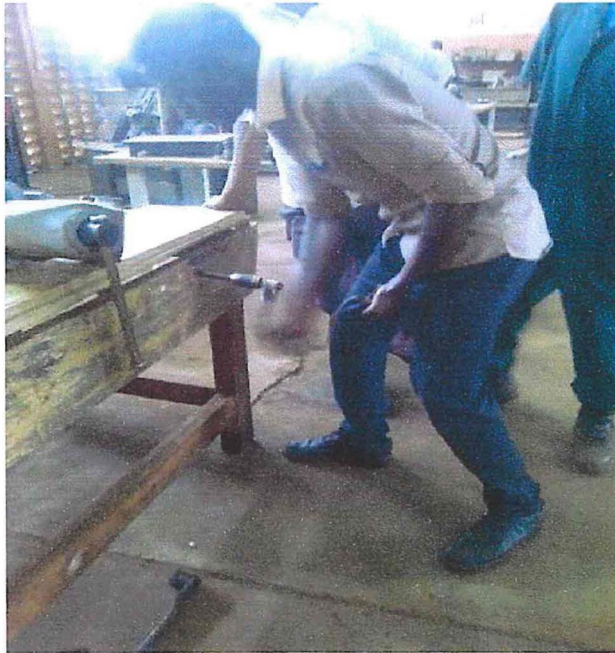


Fig. 20 drilling holes in the skirt board.

4.2.3 Preparing the mild steel plates & fixing the vices (*phase three*)

The vices provided are unique, they have one lug for bolting them direct from top, the other provision is at the edge. This feature makes it difficult to bolt the vice tight unto the bench; and this is the reason I procured the steel plates to make a provision for bolting the vice by the edge of the bench. The plates were marked and subsequently drilled; four holes in each steel plate. (Fig. 21). They were later attached to the vices by means of bolts and nuts and finally the entire unit - the vice - bolted unto the bench (fig, 22).

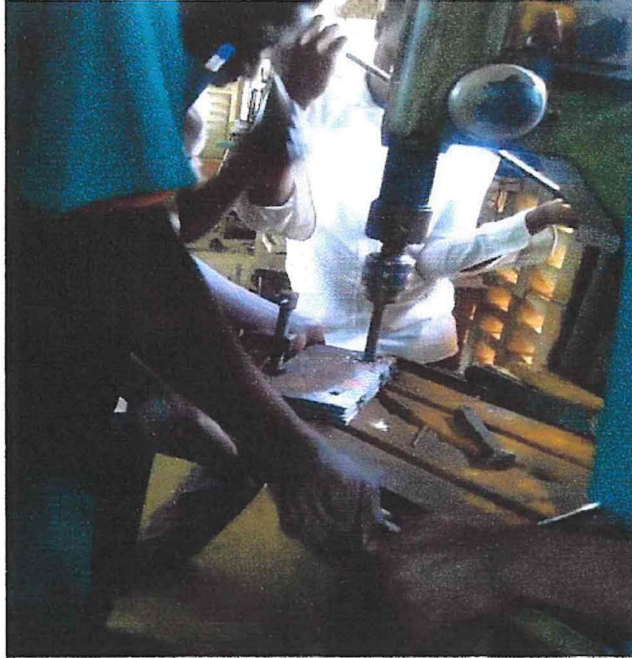


Fig 21 drilling of steel plates

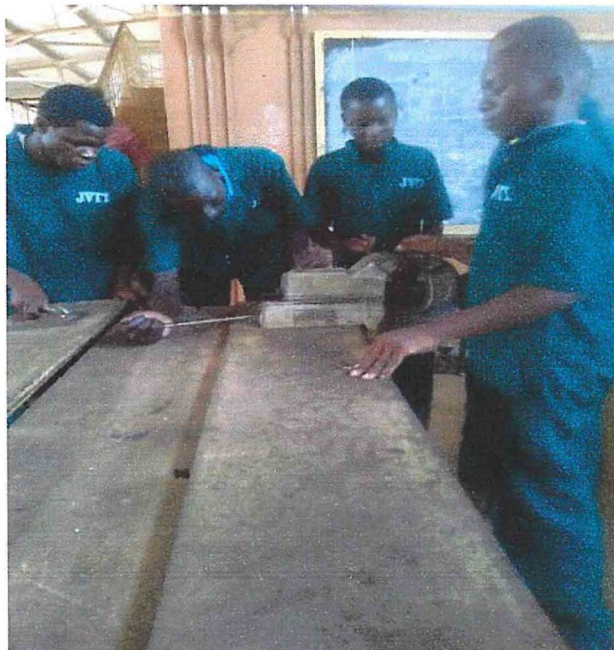


Fig. 22 fixing the vice

The bench had four vices firmly fixed at each corner and this marked the end of cycle one of the project. We gathered around the bench, looked at what we had constructed and I asked the trainees to comment on what they observed or experienced during the cycle of implementation. At first they were a little timid as

if they had not observed any thing. Many of them have a problem of communication in english, nevertheless, I encouraged them to say something at least. Then one by one they made some observations: these included tools used for instance the carpenter's clamp, many of them had not used it before. The claw hammer, they were more conversant with the engineer's hammer, the breast drill which was totally new to them. I gave an explanation about the tools and their applications; but the breast drill took much of their attention especially its application. Nevertheless, they had a good experience because they practically used it to drill the holes in the bench. We also filled in the log together and they expressed interest in many of the tasks carried out and requested for more practice to gain mastery because they were not sure whether they would ever handle a similar project.



Fig. 23 Refurbished bench with vices firmly fixed.

4.3 Second cycle - bench number two

Just as action research is in cycles, the second cycle was conducted on the second bench. This one had no vices fixed unto it. It was actually not being used for any angle function as far as skills transfer is concerned, besides, it was wobbling all

over. This bench unlike the others, had a thin galvanized sheet covering the top, nonetheless, the sheet was old and irregularly torn thus exposing its sharp edges. This posed danger to the people in the workshop. Like before, we made a list of activities required to be carried out and these included: removing the old and dilapidated thin sheet metal formerly covering it. Reinforcing the frame work; fixing the skirt boards, marking the positions for the holes, drilling the holes and finally fixing the vices with bolts and nuts.

4.3.1 Removing the sheet (*phase one*)

This was carefully removed by pulling out the nails which were holding it in place. Gradually and slowly, it was peeled off the bench leaving a clear top which was still in good working conditions. This was followed by a reinforcement phase where the frame work was held using a carpenters' clamp and its joints held firm before nailing them, thus making them firm and the entire structure rigid as seen in fig. 24.



Fig. 24 reinforcing the bench

4.3.2 Fixing the skirt boards (*phase two*)

As mentioned earlier, this bench was redundant but because we needed more equipment to boost skills transfer, we decided to repair it. From observation, we noted that the bench had no skirt boards originally; meaning that the vices could not be bolted unto it. Since action research is after improvement, the second cycle involved some new innovations. Two new skirt boards were fixed on each side, a provision for holding the vices. Specific measurements were taken to enable us cut the boards to size which were subsequently fixed by means of nails (Fig. 25).



Fig. 25 bench with new skirt boards

4.3.3 Marking and drilling (*phase three*)

The positions where the vices were to be located were marked on the skirt boards and the respective holes to accommodate the bolts were also drilled.



Fig 26 drilling holes

4.3.4 Fixing the vices (*phase four*)

Having finished to drill the holes into the boards, the vices were located in their positions and subsequently bolted onto the bench one on each side diagonally. This is the recommended status when a bench is to accommodate only two vices and as long as it is centrally placed in the workshop.



Fig. 27 Refurbished bench with two vices fixed

4.4 Third cycle - bench number three (*phase one*)

This bench had four vices but all of them loosely attached. The vices were removed and each of them had a mild steel plate attached to it by means of bolts and nuts. This was a provision for fixing the vice unto the bench using bolts and nuts.

4.4.1 Marking and drilling the bench (*phase two*)

Like we did on bench two, the vices were held in their locations and using a pen, the hole positions were marked by tracing through the existing holes on the vices. This was followed by a drilling operation.

4.4.2 Fixing the vices (*phase three*)

The vices were fixed unto the bench by means of bolts and nuts one after another. The exercise was manual, we had to lift the vices, hold them in position and finally bolt them up. One person had to operate from underneath the bench, because the nut mating with the bolt was held by a spanner from that position.

4.5 Evaluation/Reflections of the project

At the end of the project, we gathered as a group and looked at the project as an entity and later we moved from one unit to another. The aim was to critically reflect on the individual activities performed and deduce any experiences so far learned. That was just a tentative evaluation otherwise the core evaluation was conducted through questionnaires. The stake holders - administration, instructors and the trainees - were each given a questionnaire to fill. And the exercise was conducted under three themes. Theme one was about "Availability of training facilities" and this was directed to Administration. Theme two was about "Attitude", and this was answered by Instructors and, theme three was about "Efficiency" which was answered by trainees. Administration had two people; the Principal and Deputy Principal training. I had the intention of engaging all administrators but some were busy with their office duties and others shunned the exercise under the excuse that they did not understand the study. The Deputy Principal administration was engaged with other administrative issues and

requested Deputy training to stand in for him. Instructors were also two, the section is short of man power we are only three instructors. The trainees were five who filled the questionnaires one trainee had not yet reported. And these are the ones who actively participated in the study throughout.

Theme one - Availability of teaching facilities: Questions 1 & 2 pointed out that the repair of work benches and vices has improved practical training in the section; and to maintain the status quo, the institute has to procure more equipment. In response, both respondents gave the same answer - 'strongly agree'.

Table 2 representing theme one (Availability of training equipment)

	Strongly agree	Agree	Strongly disagree	Disagree	Total	Frequency % age
Question 1.	Practical training has improved in the fitter machinist section because of the repaired benches, it is the intention of the Institute to purchase more benches so as to sustain the training.					
Frequency	2	--	--	--	2	100
Question 2.	The fixing of the vices in the section has had an impact on bench work practice among the trainees, but this process can only be fully transformed when there are enough vices for all trainees.					
Frequency	2	--	--	--	2	100
Question 3.	Time for practical training has of recent proved too short following the repair of the equipment, for this reason, the training may extend to weekends.					
Frequency	2	--	--	--	2	100
Question 4.	This study has enhanced skills acquisition in the section as an administrator, I do encourage similar studies in the Institute.					
Frequency	2	--	--	--	2	100

From table 2, the data shows that the process of skills acquisition can be sustained by procuring more equipment which will cater for more trainees. This is an indicator that the intervention measures put in place were viable. For all administrators strongly agreed that more equipment need to be availed as this will help to sustain the process of imparting skills.

Question 3 talks of the time for practical training which has proved inadequate following the repair of the equipment. The idea is to extend the training into weekends in order to have everybody on board. Again all the respondents gave the same answer, they 'Agree' to extend the time.

Since all the respondents agree to extend the training time into weekends, this means that the implementation process of repairing the equipment was a positive step towards opening up the way for skills training in the section.

Question 4 looked at the value of the research study to the section and went further to seek the administrators' opinion as to whether a similar study can be conducted in the institute again. In response, the answers given were the same, 'strongly agree'. When asked why, they gave the reasons as follows:

Respondent A gave this reason: *'the repair of vices was of tremendous importance to training. More research of this nature will handle another important part of the work shop'*.

Respondent B gave this reason: *'this has produced results. Students have picked a lot of interest during practical training due to the increase of equipment in the workshop compared to before when they had just a few vices for the entire class. Now the work is simplified as there are more vices in operation'*.

Going by the answers given by the respondents, the results show that the intervention measures put in place were appropriate. This is because one respondent has come to support the study by its results and further suggests a similar study can be conducted in other areas. And that the study has positively impacted on the practical training because trainees have been highly motivated practice. This shows that the study was effective for it has repaired the equipment

which trainees can use for practical training. Even instructors now have the impetus to conduct the practical lessons without any excuse.

Theme 2 Attitude: Question 1 was about the positive impact the repair of benches has had on trainees' attitude towards bench work practice. In response, one respondent out of two marked 'strongly agree' meaning that the repair has positively influenced trainees' attitude. And the reason given is *because trainees can now produce accurate work in a given time frame, using the refurbished benches.*

And another respondent marked 'agree' meaning that the repair has had a positive influence over trainees' attitude towards bench work practice. He didn't give any reason. From personal observation, trainees have shown interest in workshop practice as the attendance has drastically improved from fifteen to thirty eight trainees. Many have even approached me for guidance over different work bench technics.

Table 3 representing theme two (Attitude)

	Strongly agree	Agree	Strongly disagree	Disagree	Total	Frequency % age
Question1.	The repair of benches has positively influenced trainees' attitude towards bench work practice. And why do you think so?					
Frequency	1	1	--	--	2	100
Question 2.	With all the vices firmly fixed, trainees have shown interest in accomplishing their tasks in time. Give reasons for your answer.					
Frequency	2	--	--	--	--	100
Question 3.	With all bench work equipment in operation, trainees' attendance has improved tremendously.					
Frequency	--	2	--	--	2	100
Question 4.	Ever since the equipment in the workshop were repaired, there has been a high demand for hand tools. Give an explanation for your answer.					
Frequency	2	--	--	--	2	100

Results in the table confirm that the repair of benches has positively influenced trainees' attitude because all respondents agree with the statement. And if the trainees' attitude has been influenced positively, then the measures implemented can be rated as successful.

Question 2 talks about the interest trainees have shown in accomplishing their tasks in time following the fixing of vices. Both respondents marked 'strongly agree' an indication that trainees have shown interest in accomplishing the given tasks in time. They all gave same reason thus; *tasks can now easily be worked on in a short time and it is now possible to work on a task and produce it according*

to the given prescriptions. This is because the equipment supporting the operations are effective and efficient.

Results in the table, show that the firmly fixed vices have motivated trainees into accomplishing their tasks in time. This confirms that the intervention measures put in place were effective as trainees have been motivated to work within the given time frame.

Question 3 was about improved trainee attendance which has been influenced by state of the bench work equipment - they are in operation. Both respondents 'Agree' that the study has caused a tremendous change in trainee attendance.

As per results from the table, all is indicative that the intervention measures applied were appropriate, trainees' attendance has improved from a few some times less than fifteen to nearly a full class. The meaning is that the dilapidated work benches were a big hindrance to bench work practice and now that this is no more, it is a confirmation that the intervention measures to improve the skills gap for mechanical technician trainees were appropriate.

And question 4 talked about an increase in demand for tools in the workshop ever since the equipment were repaired. Again both respondents 'strongly agree' that there has been an increase in the demand for tools right from the onset of the repair of equipment. The reasons given are thus;

Respondent A *because the equipment are rehabilitated, trainees are highly motivated.* While respondent B says; *bench work tools are on a high demand as the existing stock is both old and worn out and so cannot suffice the big number of trainees.*

The results from the instructors' response show that the intervention measures put in place were appropriate; as the move to improve the existing skills gap of mechanical fitter trainees in the fitter machinist section is being realized. Formerly, the demand was not there because the turn up for practice was low due to the poor state of equipment in the workshop.

Theme three; Efficiency- question 1 talked about how the repair of the benches has played a key role in promoting practical training among the trainees. In response, all the five respondents marked 'strongly agree'. They were convinced that the renovation has played a key role in enhancing practical training. The reasons given are not very different they are as follows:

Respondent A: *trainees carry out their practice with minimum effort and the exercise is more enjoyable as compared to before.*

Respondent B: *before repair, the exercise was tire-some and time consuming due to constant wobbling of the benches.*

Respondent C: *initially, the benches were not stable but now any bench work operation is done effectively.*

Respondent D: *because the benches have been properly made firm.*

Respondent E: *because the benches are now firm and rigid.*

Table 4 representing theme three (efficiency)

	Strongly agree	Agree	Strongly disagree	Disagree	Total	Frequency % age
Question 1.	The renovation of benches has played a key role in promoting practical training among the trainees. Give reasons for your answer.					
Frequency	5	--	--	--	5	100
Question 2.	The time allocated for practical training has proved inadequate for effective practice. What makes you think so?					
Frequency	5	--	--	--	5	100
Question 3.	The fixing of vices appropriately has motivated you as a trainee to appreciate bench work practice. Why do you think so?					
Frequency	3	2	--	--	5	100
Question 4.	The research study carried out was a step in the right direction regarding skills acquisition for me as a trainee. Give reasons for your answer.					
Frequency	5	--	--	--	5	100

The results from the table indicate that the intervention measures applied to improve the skills gap were appropriate. Trainees have testified that bench work exercises can now be performed with much ease, it takes relatively shorter time, it is motivating and gratifying because the outcomes are real. Before, the benches were wobbling about during practice, the vices would shift from place to place leading to inaccuracy and one would spend a lot of energy to file a metal to the desired shape.

Question 2 stated that time allocated for practical training has proved inadequate for effective practice. All the respondents gave similar answers affirming that they 'strongly agree' with the statement. Asked why they thought the time was inadequate, they gave the reasons as follows:

Respondent A: *because the equipment - work benches - are not enough and so request to extend practice time to weekends.*

Respondent B: *because practical work demands for much more time unlike theory.*

Respondent C: *because workshop practice requires more time.*

Respondent D: *the trainee population is bigger than that of equipment so more time is needed to ensure that every trainee gets the opportunity to accomplish the assignments given.*

Respondent E: *practical work has a number of operations which require more time.*

Looking at the data as reflected in the table, trainees have confirmed that the time allocated for practical training is no longer adequate. This scenario has come up especially after the research study when the equipment in the workshop have just been renovated.

Question 3 talked of how the fixing of vices has motivated trainees to appreciate bench work practice. The answers given do not vary much as three 'strongly agree' that they have been motivated while two 'agree' that they have been motivated.

Respondent A 'strongly agree' and gave the reason thus; *all trainees are doing their work with ease and precision.*

Respondent B 'agreed' and reasoned that *bench work practice can now be carried out effectively.*

Respondent C 'strongly agreed' with the reason that *bench work practice can now be carried out with ease.*

Respondent D 'strongly agreed' and gave the reason as *bench work practice can now be carried out with ease.*

Respondent E 'strongly agreed' reasoning that; *vices are firm enough and bench work practice is interesting.*

Much as the respondents had different responses to the question, the answers given are all positive, they all confirmed that fixing of vices has motivated them to appreciate bench work practice. Because the vices are firm, trainees have attached great value to the process of practical training.

Question 4 commended the entire study as a step in the right direction with regards to skill acquisition for trainees. And all the five respondents 'strongly agree' with the statement although they gave varying reasons.

Respondent A said *the trainees practice with ease and this gives them the confidence to perform well.*

Respondent B said *the study created an atmosphere where one can practice with maximum safety and acquire a skill.*

Respondent C said *the study provided information and skills.*

Respondent D said *the study enriched them with information and skills.*

Respondent E said *the study made them realize their mistakes and were able to improve.*

A close look at the table shows that the respondents confirm that the research study carried out was a step in the right direction as far as skills acquisition is concerned. This is confirmed from the reasons given by the respondents.

4.5.1 Interpretation of the results

I do present the evaluation results under three themes. Theme one; Availability of training facilities - The questionnaires had four questions and they were majorly hinged on objective number 4 which states: Evaluate the activities put in place to improve the skills gap for mechanical technician trainees in the fitter machinist

section. The target area for the questionnaires was work benches and the vices. These items play a key role in promoting skills transfer among the trainees. The question to ask is; did the activities bring forth the results needed? The responses from the questionnaires suggest that the activities put in place yielded the required results. From observation, the implementation phase was effectively handled, the benches renovated were put to use by the trainees including the vices. From an observational perspective, bench work exercises are effectively being practiced bringing out good results, an indicator that the measures implemented towards the challenges to skills acquisition were appropriate. Comments from the Principal indicate that he appreciated the outcome of the study more especially when he suggested to have a similar study in other sections. In short, the results from the evaluation process confirm that the study was vital and it has brought about the necessary changes.

Theme two; Attitude - Instructors reported that the study has influenced trainees' attitude towards bench work practice and also motivated them into accomplishing the tasks assigned to them in time. The urge to fulfil their desire to learn, and do all the assignments in time has highly been rekindled among the trainees. This can be confirmed by the improved attendance during practical training which has consequently resulted into a high demand for tools in the workshop. All these are viable indicators that the measures implemented to curtail the challenges to skills acquisition were timely.

Theme three; Efficiency - The spirit to crave for practical training among the trainees is the consequence of the intervention measures. The equipment are intact and can be used for any bench work operation without getting weary of any accident. In the long run, the time for workshop practice has proved too short, as many trainees have recently turned up for practice to improve their practical skills. There is an apparent kind of 'competition' among the trainees to perform better and accomplish the given tasks in time and, also master the skills for purposes of excelling as mentioned by one trainee. Trainees have come out to appreciate the study for it has changed the state of the workshop from an idle shop into an industrious place. In conclusion, I have appreciated the study because it

exposed the stake holders to new challenges in life. Trainees were able to share knowledge and skills, they were also able to collaborate and communicate effectively and all of them contributed positively towards the success of the study.

4.5.2 Self-assessment

Like Luszczynska (2011) emphasizes that self-assessment is a more natural and favourable system in evaluating active learning. Through the three cycles, the activities were more or less the same, otherwise the first two cycles were more enriched and therefore very educative in terms of skills. Students commented on the whole project as beneficial, they were exposed to carpentry as a discipline, the operations carried out and the corresponding tools; especially when it came to applying them practically. From the authors' observation, it was noted that some students had developed interest in the study, for they participated with vigour and exhibited enthusiasm. The author worked with them throughout the project with keen an observation occasionally, I would intervene just to give guidance. Like (Downes, 2010, p. 28) states - we need to consider learners not only as the subjects of learning entities, to whom we deliver learning content but also as a source of learning, functioning as the perceptual input for a wider network. Regarding the learning experiences, they felt the time for the project was short because the particular activities were carried out with ease as they practiced all the skills involved. They needed to practice a little longer in order to gain mastery. Perhaps this study needed to involve a lot more benches; that is when everyone would get the opportunity to practice for some specific period. On the whole, it was successful; two regular benches were thoroughly rehabilitated and a third bench was also put to use. This is a great achievement for the section because ten students can carry out bench work processes comfortably and independently. This is in line with the theme of the study - Improving technical skills gap of mechanical technicians in the fitter machinist section. As we were implementing the project, the benches already repaired were being put to use by the technicians and trainees - practical evaluation - a viable indicator that the project was successful.

4.5.3 Challenges

The study was conducted in a free atmosphere never the less, I experienced some challenges. Much as the trainees were aware of the study, many of them were reluctant to participate. This could be linked to the conflicting time table where they had project work and at the same time they were supposed to carry out the implementation. There was also a shortage of tools during the implementation, for instance we had one spanner which was being shared with other users of the workshop. As the term drew to a close trainees had to prepare for examinations and this affected my progress as they abandoned me without notice. The third strategy where I was supposed to repair the lathe machines was not fulfilled because of the time constraint.

4.5.4 Observations from the Principal

I sought audience with the Principal and asked him to visit the workshop and look at what I had done so far. He was both surprised and happy to see three benches fully repaired and in good working conditions. He actually gave me a hand shake in appreciation and requested that I continue with my research in other sections and work on the benches there in a similar manner.

4.5.5 Observations from colleagues

They were impressed with the project and commented that this study should have taken place earlier. They went further and suggested that instructors in other sections borrow a leaf and also carry out an action research to refurbish the equipment in their sections. They were happy for the workshop can now ably support a batch of ten candidates at one setting carrying effective bench work exercise training unlike before where only a few trainees would be seen in the workshop pretending to practice bench work. Even workshop technicians were seen using the refurbished equipment with gratification for there was efficiency and effectiveness in the whole process of bench work application.

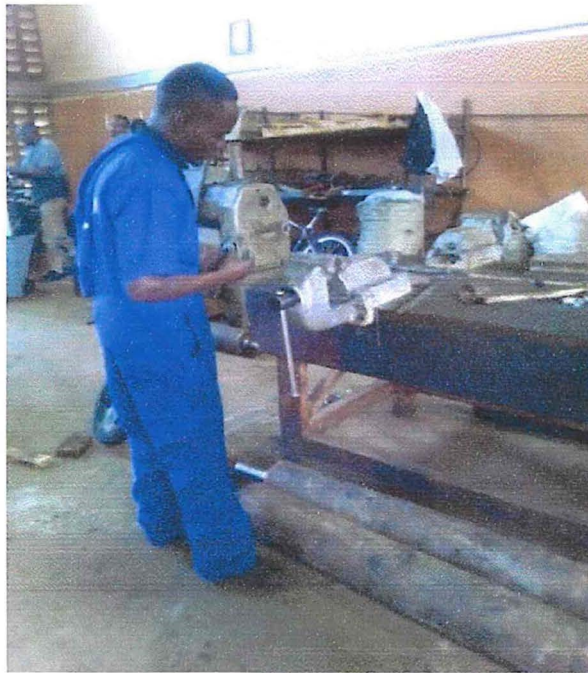


Fig. 28 Technician testing a vice



Fig. 29 Testing the bench & vice

4.6 Teaching approaches employed in the implementation phase of the research study

The section presents the different pedagogical approaches which were used in the implementation phase of the research study whose aim was to improve the skills gap of mechanical technician trainees in the fitter machinist section at Jinja Vocational Training Institute. These included interactive, collaborative and experiential approaches.

4.6.1 The interactive approach

This approach took precedence right from the stage of situational analysis; during the focus group discussions, there was free interaction between teachers and students throughout and this brought forth results which culminated into the future workshop. Another platform where students were given the liberty to participate interactively. As the study advanced, there was regular interaction, before and during implementation, we interacted with the trainees and the technicians to plan the road map. Different suggestions were brought forward by individuals at will and through brain storming, resolutions were made. This increased Students' motivation and engagement in accomplishing the planned activities. Interaction as an entity leads to acquisition of other skills like communication, listening and, presentation skills among many others. Besides, a social component is automatically built among the trainees thus creating a culture of oneness.

4.6.2 Collaboration

In order to achieve the intended goal(s) in any learning environment, collaboration must exist. Collaborative learning is a teaching approach in which learners work together to perform an activity. In the same vein, as we were executing the study, there was collaboration among ourselves. That is why we worked together as a group, and through collaboration, we shared information, set goals, and worked together to ensure that we reached the target. The learners were involved in sharing of ideas in groups about their experiences from their projects activities. In respect to the study, the trainees got involved in the repair of

benches and fixing of vices, some cleared the work place while others prepared the tools and materials. Learning cooperatively with fellow students helped to enhance inter personal and cognitive skills to a higher level. Through the study collaboration was the major link, learning and assessment were collaboratively handled at every phase.

4.6.3 Experiential learning

In the process of implementation, trainees were actively involved in carrying out the various activities. With reference to the theme: Improving technical skills gap of mechanical technician trainees in the fitter machinist section: a case of Jinja Vocational Training Institute, experiential learning was adopted as the model of learning. The objective of VET is to produce manpower with relevant skills which can be put to use in a productive manner. A skill can effectively be acquired through a hands on approach one of the underlying principles of experiential learning - learning by doing - a theory which was spear headed by John Dewy. It enhances students' experiences in a learning environment, which may be a classroom, a laboratory or workshop. It encourages students to participate actively and develop personal interest in the lessons there by becoming lifelong learners. It is initiated by the teacher through a demonstration after which the learner is asked to imitate and through trial and error, s/he acquires a skill and gradually masters it.

CHAPTER FIVE: DISCUSSION, CONCLUSION & RECOMMENDATIONS

5.0 Overview

In the chapter, I present the discussion and conclusion of the findings and some recommendations which may help to improve the training/learning process at JVTI, with regards to practical skills acquisition.

5.1 Discussion

The study was conducted under the theme –Improving technical skills gap of mechanical technicians in the fitter machinist section at JVTI; under the following objectives: -

- * *Establish the gaps hindering practical skills acquisition in the fitter machinist section.*
- * *Identify measures of addressing the gaps hindering practical skills acquisition in the section*
- * *Implement the activities identified to improve practical skills acquisition in the section.*
- * *Evaluate the identified activities put in place to improve practical skills acquisition in the section.*

5.1.1 Objective one

Based on the data collected from the stake holders, it was realized that mechanical technicians from the fitter machinist section had gaps with regards to practical skills acquisition. This echoes objective one of the study and the gaps established were related to equipment and tools which were inadequate and in a poor shape and therefore could not enhance skills training. Mbugua et.al (2012) lament about the inadequate training materials and use of inferior equipment in TVET which have compromised the relevance of skills needed by industries. Udofia et.al. (2012) affirm that there is significant relationship between workshop equipment

for training and acquisition of employable skills. And Joerres (2012) emphasizes that skills gap is indeed preventing employers from finding the talent they need. The equipment in question included the work benches and, the fitters' vices. All these needed maintenance and repair in order to get the best out of them; for they play a vital role with regards to skills acquisition during the training process.

5.1.2 Objective two

Identify measures of addressing the challenges hindering practical skills acquisition – the measures identified to address the challenges included i.) Maintenance of the affected machine tools, lathe machines in particular, ii) repair of the work benches and iii) fixing of the vices attached firmly. These measures once addressed will set a foundation for minimizing the challenges associated with skills acquisition during the process of training. Maintenance is the process of keeping the machine and equipment in good working condition so that the efficiency and life of the machine are increased (Elangovan, 2015). Indeed, when maintenance is incorporated as an essential factor in engineering, machine tools will have their performing capacities up graded and this will also increase on their life span too. The primary goal of maintenance is to avoid or mitigate the consequences of equipment failure for this state tends to disrupt the training generally and this impacts negatively on the process of practical skills acquisition specifically.

5.1.3 Objective three

Implement the activities identified to improve practical skills acquisition in the section – In the course of the study, implementation was successfully conducted and it involved carrying out a variety of activities. Benches were worked on in relation to the necessary repairs. One bench had its top replaced and the frame work reinforced while another bench had its top cleaned by removing the old thin galvanized sheet, its framework was also reinforced making it stable, strong and rigid, and new skirt boards fixed. The remaining bench had its top properly reinforced. Finally, all these benches had vices firmly fixed unto them with the help of five bolts and nuts on each vice as opposed to one bolt and nut as

originally found. The interpretation is that equipment – benches and vices are readily available for practical training, thus a process for skills acquisition to produce competent technicians.

5.1.4 Objective four

Evaluate the identified activities put in place to improve practical skills acquisition in the section – After implementing the suggested measures, an evaluation was carried out just to check whether the identified activities carried out were showing any indicators for improved practical skills acquisition.. The results from the evaluation process show that the intervention measure put in place yielded positive results. Trainees were seen practicing their skills using the repaired equipment.

Theme 1 Availability of training facilities -equipment - the work benches and the vices were repaired and firmly fixed respectively, and the process has resulted into regular practice as far as bench work exercises are concerned. Bulama, (2001) reiterates that instructional facilities for VET encompass all basic hand tools, equipment, classrooms, workshops among others which help the learners to acquire knowledge and skills. Articles produced showed that skills-acquisition was taking place. Observation indicated trainees were seen practicing appropriately and with zeal. Comments from the Principal also confirmed that the repair of the equipment was a step in the right direction especially when he suggested to extend the study to other sections in order to repair the benches there as well.

Theme 2. Attitude The implementation process has influenced trainees' attitude towards appreciating bench work as a training process for acquiring skills. Additionally, it has also motivated them to take assignments seriously, for since the equipment were repaired, trainees have exhibited a lot of interest in accomplishing the tasks given to them within the given time. The improved attendance and the increase in demand for tools during bench work practice are all signs that trainees' attitude towards practical learning has changed positively. The hindrance to practical skills was appropriately handled. Chapman, (2003) asserts

that a rigid work bench is an essential motivator towards bench work practice. The rigid benches have injected enthusiasm into the trainees to such a level that they have adapted a positive attitude towards bench work practices. This precedent has made the trainees develop a new trend of practicing bench work regularly and deliberately. This according to Dewy enhances the learners' experiences in a learning environment and eventually transforms them into lifelong learners. This process eventually leads the learners to expert performance.

Theme 3. Efficiency The abrupt change in attitude towards work shop practice by the trainees is an indicator that the study indeed tackled the problem of skills acquisition in the section. This has further been confirmed by the short time now being experienced during work shop practice. They are yearning to learn more through constant practice in order to improve the skills so as to become efficient and proficient. This is emphasized by Campitelli & Gobet, (2011) that deliberate practice is a key factor as far as acquiring expertise is concerned. In the same vein they affirm that deliberate practice occurs when an individual intentionally repeats an activity in order to improve performance. The administrations' willingness to extend the training time to weekends also indicates that they too have appreciated the results of the study. They have come to appreciate trainees' demand to improve their skills by extending the time for practice to weekends. Through observation, the environment in the workshop has changed, trainees no longer linger around, once it is time for workshop practice, they are busy practicing a skill at least. This is a confirmation that the research study conducted played a positive role towards improving the skills gap of mechanical technician trainees in the fitter machinist section.

5.2 Conclusion

The study sought to improve the skills gap of mechanical technicians in the fitter machinist section and it aimed at answering the questions below: -

1. What gaps are hindering skills acquisition in the fitter machinist section?
2. What steps can be taken to address the training skills gaps in the section at JVTI?

3. What should be done to improve practical skills acquisition?

4. How will the effect of implemented activities be determined?

Much as the study revealed that gaps leading to ineffective practical training are associated with non-functioning machine tools and the poor state of equipment in the workshop, there are other factors which hinder skills acquisition in the section. The researcher in his opinion has noted the following: incompetent instructors, who prefer to conduct theory lessons only to suit their convenience. The non-coordinated training between VET and the WOW where there is a mismatch between the needs of the WOW and what is taught - curriculum. VET is oriented to practical skills acquisition to ensure self-sustenance and service to the world of work. Developing a skill requires practice that is doing the task physically - learning by doing - this is in line with experiential learning where a learner builds knowledge by integrating old and new experiences until a skill is finally mastered as advocated by Dewey. This is supported by Vygotsky, in Mjelde, (2005) when he argues that learning becomes more meaningful when a learner observes a teacher demonstrating a skill after which the learner also practices. After a number of trials, the learner acquires experience, then gains expertise and eventually becomes proficient.

The study outlined the identified activities intended to address the challenges of skills acquisition and these included Maintenance and general repair of equipment and tools meant to enhance skills acquisition. The measures identified were appropriately implemented through a series of identified activities. And finally the identified activities were evaluated to determine their effect. The process involved questionnaires which were subjected to the stake holders namely: administration, instructors and trainees and observation was also used as another mode of evaluation. The theme of the study was fulfilled in accordance with the objectives. The study brought forth three scenarios; i) Training facilities were made available thus giving the trainees the opportunity to practice. This culminated into another precedent of attitude change. ii) Trainees developed a positive attitude towards bench work practice, something which was not there before. iii) This development

eventually resulted into efficiency through regular and deliberate practice since the equipment were fully operational. All this sums up the study as having been successful.

5.3 Recommendations

This study conducted at JVTI unearthed other irregularities affecting training and learning in general. Despite the fact that these irregularities were coined from one institution, the author is convinced that other VET institutions experience the same. It is against this back ground that he puts forward the following recommendations:

- i) Admission of new students should be based on the training facilities available, to avoid overcrowding.
- ii) A roster should be drawn for servicing the equipment on a regular basis at least once a term.
- iii) A collaboration with industries should be established to increase trainees' potential for skill acquisition and also adopt new technology.
- iv) A maintenance management system should be put in place to handle major maintenance activities of all equipment in the Institute.

5.4 Area for further research

The primary goal for this dissertation was the fulfillment of the requirement for the award of a Master's degree in Vocational Pedagogy; that notwithstanding, the findings from this study should open a number of informed questions to guide action research in the field of skills training and equipment management. It is my high expectation that these questions will enrich the forth coming researchers as a form of resource. Some topic for research:

How can skills acquisition in VET institutions be developed to encompass the current dynamic technological innovations adapted by the World of work?

For effective skills transfer in VET institutions, there is a great need for BTVET as a department to take the initiative and open collaboration with the world of work. Bearing in mind that VET institutions are still using the old technology in

controversy to what is in most of the industries. This will help to both instructors and trainees to keep abreast with new technology.

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APPENDICES

Appendix I: Challenges raised

A list of challenges raised by the stakeholders during situational analysis.

1. Equipment and tools not adequate to match the learner population (ratio is 2:40) EQ
2. Some machine tools in the work shop are not operational (shaper & some lathes m/cs) EQ
3. Safety – all emergency switches are non-operational. EQ
4. Practical training is accorded less time compared to theory. TR
5. Inadequate training materials for practicals. TM
6. Some cables have their insulation torn/ broken EQ
7. Some machine tools have no accessories. EQ
8. Machine tools require regular repair/servicing. EQ
9. Instructors do not give feedback to learners. TR
10. Library is too small for the student population. AD
11. Relevant books in the library are too few (e.g. workshop technology by Chapman only 3 copies). AD
12. Internet is not stable. TM
13. No adequate working space in the workshop. INF
14. Time table needs to be reviewed TR
15. Classrooms are congested during lessons. INF
16. Computers are not enough ratio (5: 1) learning is not effective TM
17. Syllabus is not completed in time. TR
18. Instructors don't attend to learners regularly TR
19. Administration is not friendly to students AD
20. No classrooms for preparation after supper. INF

Key: EQ -Equipment

AD - Administration

TM - Training Materials

INF - Infrastructure

TR -Training

Appendix II: Categories of challenges

The challenges as clustered under the five categories.

S/N	Category	Challenges in each category
1.	Equipment & tools	<ul style="list-style-type: none"> i) Equipment & tools not adequate to match trainee population ratio (2:40) ii) Some machine tools are not operational e.g. shaper iii) All emergency switches don't function iv) Some cables to machines have broken insulation v) Machine tools require regular repair/service
2.	Training	<ul style="list-style-type: none"> i) Practical training is accorded less time compared to theory ii) No feedback from Instructors iii) Syllabus not completed in time iv) Instructors don't attend to learners regularly
3.	Training materials	<ul style="list-style-type: none"> i) Inadequate training materials for practicals ii) Library not equipped with relevant books e.g. Workshop Technology 3 copies only iii) Internet not stable iv) Computers not enough ratio (5:1) learning not effective
4.	Infrastructure	<ul style="list-style-type: none"> i) Library too small for the trainee population ii) No classrooms for preparation after supper
5.	Administration	<ul style="list-style-type: none"> i) Administration not friendly to trainees

Appendix III: Pair wise matrix

Pair wise ranking matrix showing the critical problem and how it was ranked.

Problem		Problem Number				Score	Rank
		1	2	3	4		
1	Equipment & tools		1	1	1	3	1
2	Training & training materials			2	2	2	2
3	Infrastructure				3	1	3
4	Administration					0	4

Appendix IV: Minutes for the future workshop

Minutes of the meeting/workshop held on Monday June 7, 2017 at 12.00 pm in the class room within the Fitter Machinist section.

Members present:

1. Tenywa Moses stake holder
2. Muhumuza Freddie stake holder
3. Dr. Nyende Jacob Supervisor
4. Musoke Henry Colleague
5. Yamumpereka Grace colleague
6. Bayo Kevin stake holder
7. Musasizi Emmanuel stake holder
8. Ssemanda Joel stake holder
9. Odong Lawrence stake holder
10. Obong Emmanuel stake holder
11. Ekuriei Denis stake holder
12. Opatiti Paul Instructor
13. Balidawa Workshop technician
14. Bisso Muhamad Assistant work shop technician
15. Mugombesya Patrick Researcher
16. Muzito Moses Colleague

Absent with apology

1. Tumuhanye Deputy Principal Administration
2. Ngaga-zangu Lazarus Deputy Principal Training

The researcher called the meeting to order by apologizing for the delay in starting the meeting. He however, thanked all the members present and gave an outline of the rules to be followed while conducting the meeting. He said members were free to express themselves and every body's ideas/contribution will be respected.

A brief flash back was made regarding the previous meeting just to remind the members of the objective of the meeting. The theme was then presented to the members and all were asked to deliberate.

THE ISSUE AT HAND WAS EQUIPMENTS AND TOOLS

A member Mr. Muzito was requested to facilitate the workshop while madam Yamumpereka was requested to take the minutes.

From the onset, the stake holders generated a number of ideas which all relate to the main issue and they were recorded as follows:

1. Tools are not enough
2. Tools are worn out
3. Machines are poorly maintained
4. The slotting machine is not operational
5. Some lathe machines are not operational
6. The number of trainees far exceeds that of machine tools
7. Inaccurate products due to worn out tools
8. Outdated machine tools e.g. shaping machine
9. Unstable working benches
10. Vices poorly fitted unto the benches
11. Lathe machines lack accessories –four-jaw chuck
12. New milling machines not fit for training purposes
13. Surface grinder not operational
14. Motors for drilling machines overheat while operating and they also lack chucks and vices
15. Inadequate space for bench work operations

At this juncture, the facilitator requested the stake holders to fantasize the issues listed or look at them from an ideal situation, and the results were noted as follows:

1. Enough tools
2. New tools
3. Well maintained machines
4. Functioning slotting machine
5. All lathe machines operational
6. Adequate equipment and tools for all trainees

7. Accurate products as a result of new tools
8. New shaping machine
9. Firm working benches
10. Vices firmly fixed unto the benches
11. Lathe machines provided with accessories
12. Appropriate milling machines
13. Operational surface grinder
14. Motors to the drilling machines adjusted
15. Enough working space for bench work operations

The issues raised were then categorized into three, i.e. Long term, Medium term and Short term. This was because this research is limited as far as time is concerned and the other factor is the resources meant to facilitate the required remedies. From the list, three areas were pin pointed under the short term category and they are as follows:

- Well maintained machines
- Firm working benches
- Vices firmly fixed unto the benches

All stake holders unanimously agreed to handle the three issues in groups; three groups were formed and a work plan was developed giving the details of the requirements and time frame for accomplishing the research.

Appendix V: Budget estimate

S/no.	Item	Unit cost	Quantity	Cost
1.	Papers (Reams)	20,000/-	01	20,000/-
2.	Computer printer	450,000/-	01	450,000/-
3.	Refreshments/meals	15,000/-	15	225,000/-
4.	Talk time	-	-	100,000/-
5.	Flip charts	25,000/-	02	50,000/-
6.	Markers	20,000/-	1 packet	20,000/-
7.	Transport	-	-	100,000/-
8.	Box files	15,000/-	02	30,000/-
9.	Binding of documents	-	-	30,000/-
10.	Miscellaneous			100,000/-
11.	Total	-	-	1,125,000/-

Appendix VI Work plan I

Activity	Nov. 2016	Dec. 2016	Jan. 2017	Feb. 2017	Marc 2017	April 2017	May 2017
Situation analysis							
Proposal writing							
Implementation							
Evaluation							
Report writing							

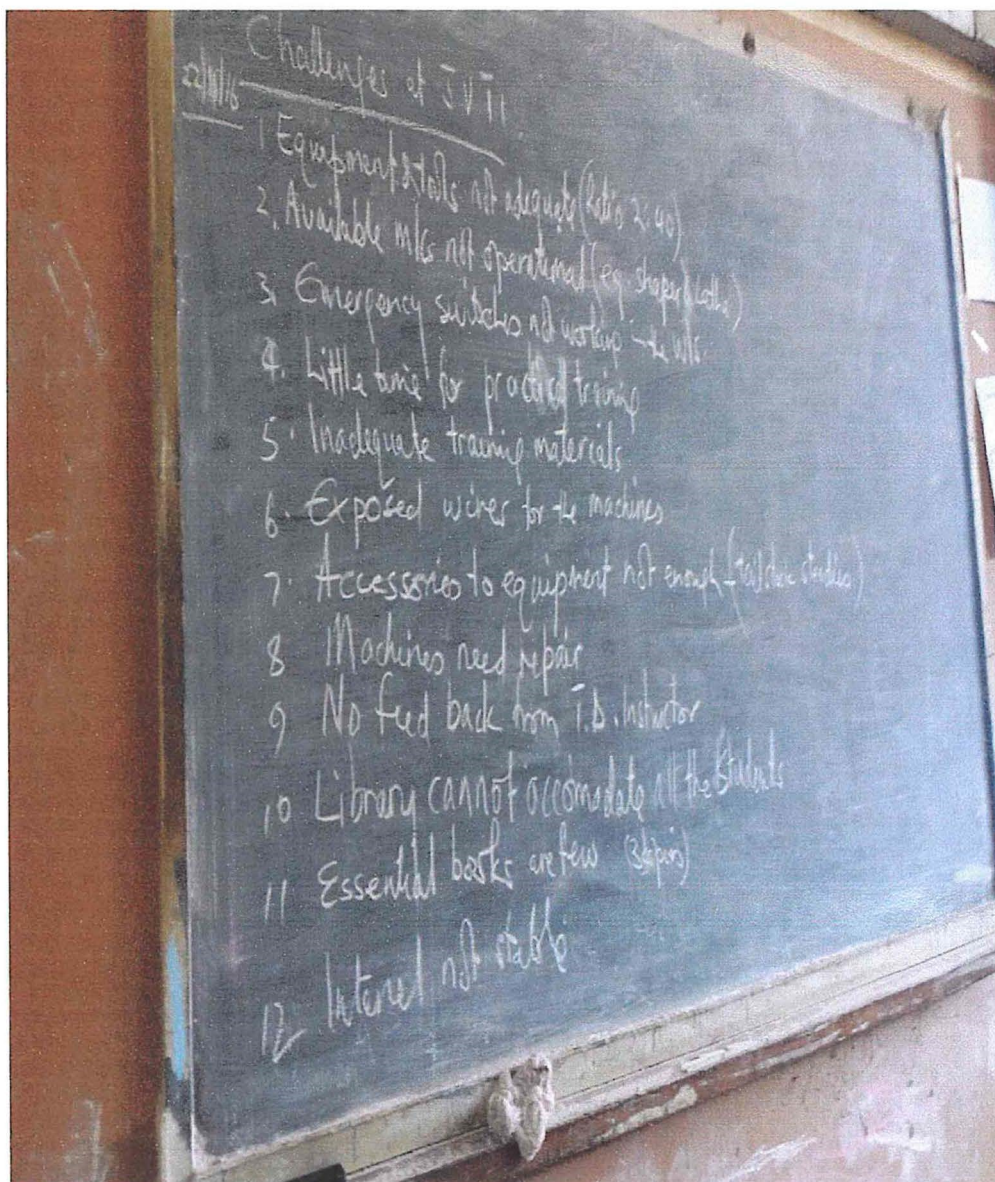
Activity	Jun 2017	July 2017	Aug 201	Sept 2017	Oct 2017	Nov 2017	Dec 2017
Defence							
Submission							
Graduation							

Appendix VII: Schedule of implementation

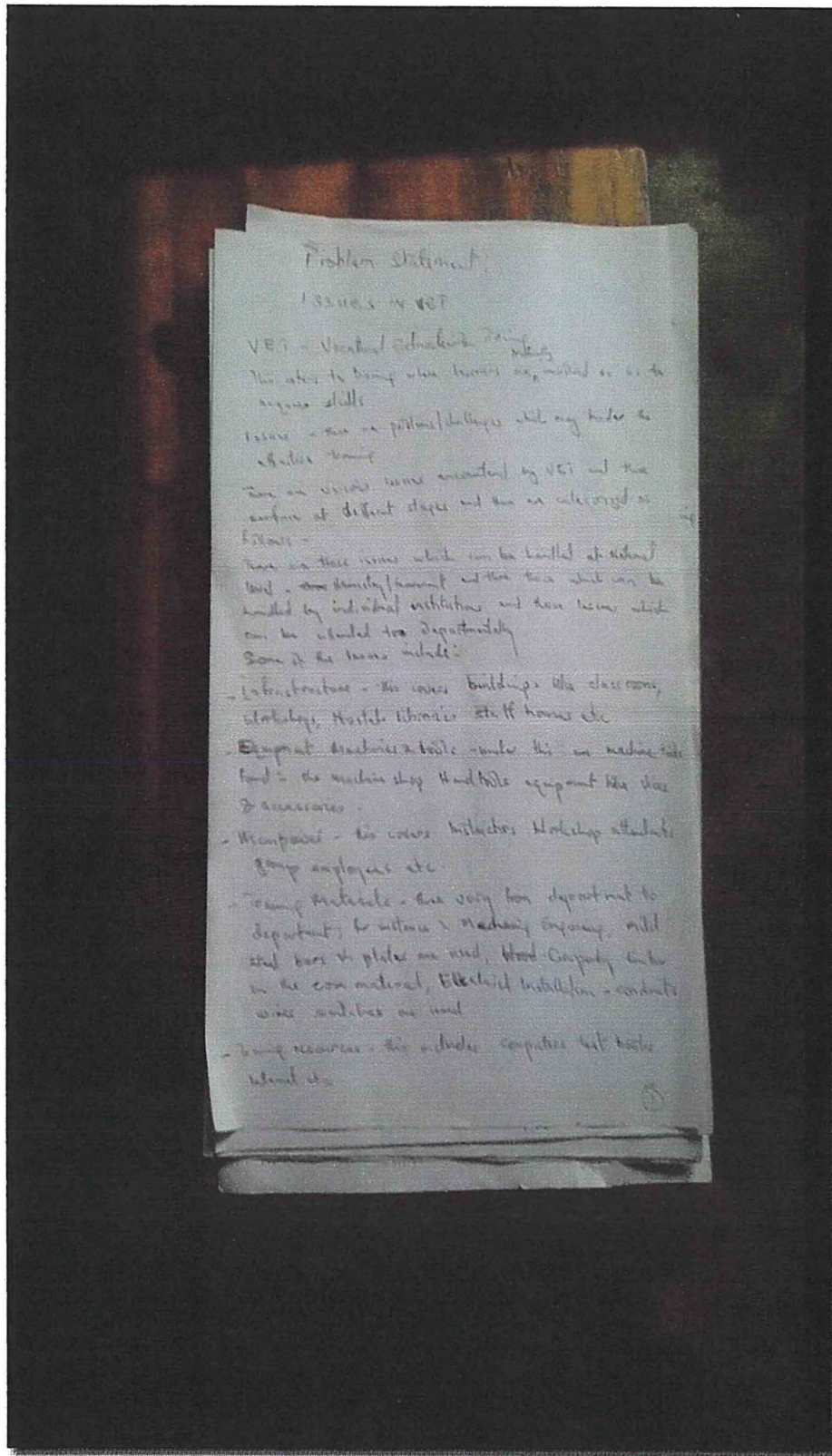
Activity	Personnel involved	Requirements	Time frame	Performance indicators
Machine maintenance	Mugombesya P. Balidawa R. Bisso Muhamad All trainees	Funds Lubricants Spares/Materials Check list	Three weeks	Lubricants procured Roster drawn
Bench repairs	Balidawa Wamimbi Paul Ebong Emmanuel Muhumuza Freddie	Timber for struts and braces, Bolts and nuts Brackets (iron angles)	Two weeks	New timber purchased New bolts & nuts
Fixing vices	Bisso Muhamad Odong Lawrence Ekuriei Denis Tenywa Moses	Bolts and nuts Tools Timber	One week	New bolts & nuts secured

After drawing the work plan, stake holders volunteered to join groups of their choices; and all were cautioned to be committed to the duties assigned so that all activities are accomplished in time since there is another phase of evaluation. It was therefore agreed that the whole process takes the whole month of June.

Having finished all business, the researcher paid glowing tribute to all members for being patient enough to the very end. He thanked all members and closed the meeting at 1.20 pm.

Appendix VIII: challenges as noted from the chalk board

Appendix IX: Minutes of the second meeting



Below - p. the analysis carried out on 24/1/16 a number of issues were raised by the stakeholders etc. of the future workshop -

- ① Equipment & tools are not adequate as far as the number of trainers is concerned. (Photo 2.40)
- ② Some mechanical tools - the W/Shop are not operational e.g. vice etc.
- ③ Safety - All emergency switches must not work.
- ④ Practical training is recorded less time compared to theory
- ⑤ Inadequate training materials for practicals
- ⑥ Some cables have their insulation torn/broken
- ⑦ Some materials do not have accessories
- ⑧ Mechanics need repair/service frequently.
- ⑨ There is no feed back from instructor
- ⑩ Library is too small to accommodate all students
- ⑪ Relevant books in the library are too few (Scrap)
- ⑫ Internet is not stable
- ⑬ There is no adequate working space in the W/Shop
- ⑭ Time table needs to be reviewed.
- ⑮ Classrooms are too small for the trainers (over congestion).
- ⑯ Computers are not enough Ratio 5:1
(training is not effective)
- ⑰ Syllabus is not completed in time
- ⑱ Instructors don't attend to increase regularly

The issues raised by the stakeholders were
then clustered into five categories namely:

- Equipment & tools
- Training Materials
- Training
- Infrastructure
- Administration

To see if we could simplify further ranked by voting
and the results were:

Equipment & tools	-	26 votes
Training Materials	-	3
Training	-	2
Infrastructure	-	0
Administration	-	-

On further scrutiny the stakeholders realised
that Training materials & Training are interrelated and
so decided to merge them into one problem i.e.
Training & Training materials and Training are by
consulting with it stakeholders.

- 1) Equipment & tools
- 2) Training & Training materials
- 3) Infrastructure
- 4) Administration

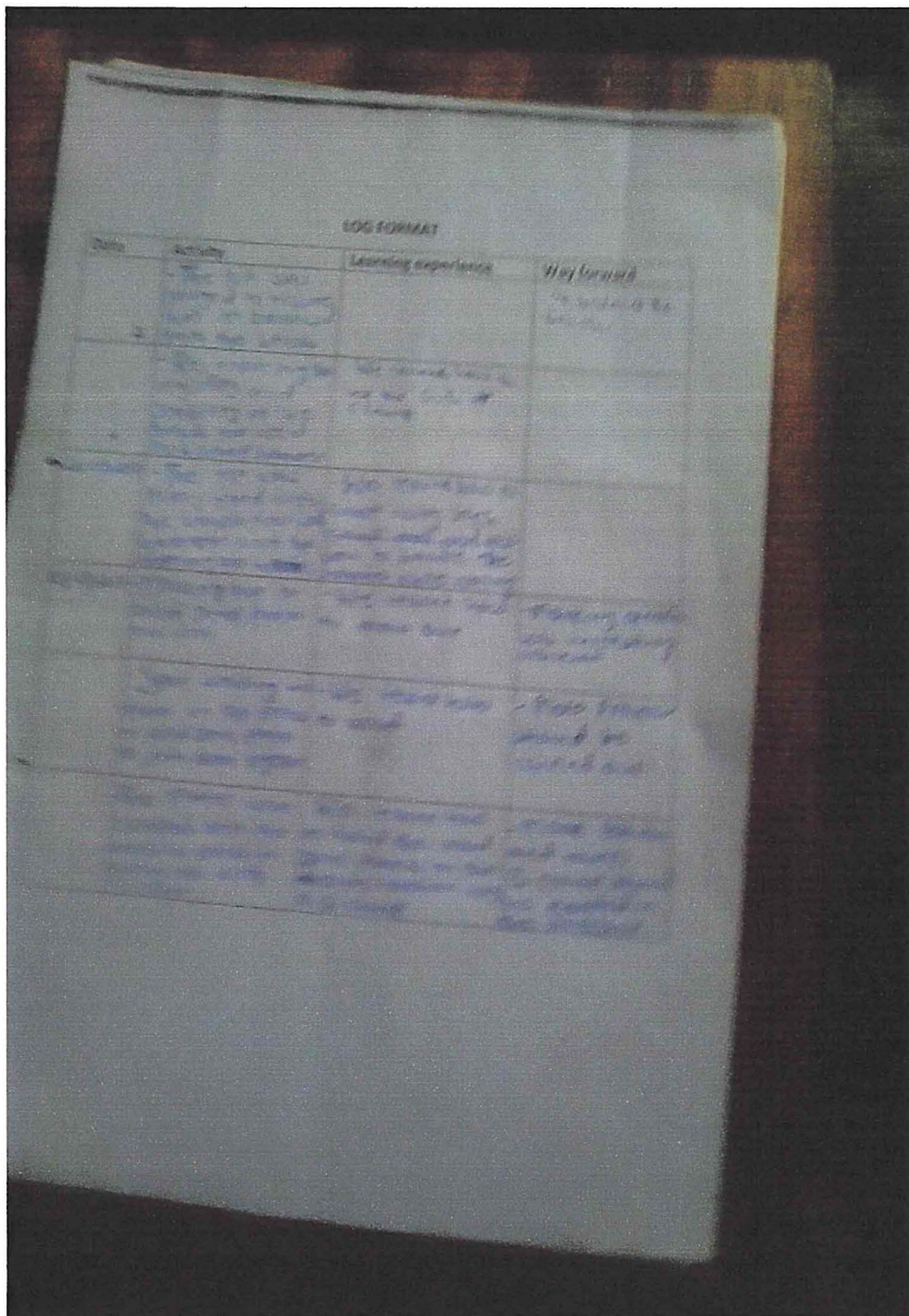
MINI ATTENDANCE

11/07/2016

LIFE SKILL PROJECT

NAMES OF STUDENTS		SIGNATURES
1	JACKLINE	[Signature]
2	MELAND	[Signature]
3	MARVIN	[Signature]
4	PAUL	[Signature]
5	IVAN M	[Signature]
6	ISAAC	[Signature]
7	DEARIS	[Signature]
8	MOSE	[Signature]
9	EMMANUEL	[Signature]
10	SONIA	[Signature]
11	SEMAEL	[Signature]
12	CHARLES	[Signature]
13	RICHARD	[Signature]
14	TERRELL	[Signature]
15	TERRELL	[Signature]
16	STEPHEN	[Signature]
17	STEPHEN	[Signature]
18	JESSICA	[Signature]
19	LAWRENCE	[Signature]
20	DEALS	[Signature]
21	ROBERT	[Signature]
22	AMITY	[Signature]
23	JAMES	[Signature]
24	BOB	[Signature]
25	CHARLES	[Signature]
26	MICHAEL	[Signature]
27	DAVID	[Signature]
28	EMMANUEL	[Signature]
29	TENNIS	[Signature]
30	KVIN	[Signature]
31	LORENA	[Signature]
32	TERRELL	[Signature]
33	AMITY	[Signature]

Appendix X: Log forms



LOG FORMAT

Date	Activity	Learning experience	Way forward
1st Oct	Driving the m/c on the path	Mass production was encountered at a learning experience	We need more practice in mass production
2	Fixing the pipe for the new wing built and fixed	Application of right spanner	
3	Cutting off the unwanted part of the bolt using hacksaw		
4	Drilling the holes for the pipes to provide passage for the cables	We learnt how to use carpenter's drill	More practice should be carried out
5	Spinning the bolts and nuts using spanner and nut	Selection of the right tool (spanner) - tightening - The bolt heads will tighten	More tools (spanners etc) should be provided
6	Marking the correct hole positions on the benches	How learnt how to do with marking out	

18-08-2017
 ATTENDANCE
 NICKOLSON DENU
 OBONG EMMANUEL
 ODUNGO LAWRENCE
 MPTANAO ROLLAND

20-08-2017
 - ODUNGO LAWRENCE
 OBONG EMMANUEL
 MUTUMUZA FREDINE
 TRWAC CHARLES

25-08-2017
 ODUNGO LAWRENCE
 OBONG EMMANUEL
 MPTANAO ROLLAND
 MUTUMUZA FREDINE

19-08-2017
 OBONG EMMANUEL
 TRWAC JUSTINA
 ODUNGO LAWRENCE
 WIMBEDI JULIUS
 TRWAC CHARLES
 EKUREI DENU
 WIMBEDI PHIL
 MUTUMUZA FREDINE
 MPTANAO ROLLAND

10-09-2017
 ODUNGO LAWRENCE
 OBONG EMMANUEL

14/09/2017
 OBONG EMMANUEL
 ODUNGO LAWRENCE

Appendix XI: Questionnaires

Questionnaire for Instructors

You are requested to answer this questionnaire by ticking or circling the appropriate answer and where necessary, give a brief explanation to defend your answer.

Do not write your name on the questionnaire and all information given here will be treated with all the confidence it deserves.

1. The repair of benches has positively influenced trainees' attitude towards bench work practice.

A) Strongly agree. B) Agree. C) Strongly disagree D) Disagree.

And why do you think so?.....

.....

2. With all the vices firmly fixed, trainees have shown interest in accomplishing their tasks in time.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

What makes you think so?.....

.....

3. With all bench work equipment in operation, trainees' attendance has improved tremendously.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

4. Ever since the equipment in the workshop were rehabilitated, the demand for tools has increased.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

Give an explanation for your answer.....

.....

Questionnaire for Trainees

You are requested to answer this questionnaire by ticking or circling the appropriate answer and where necessary, give a brief explanation to defend your answer.

Do not write your name on the questionnaire and all information given here will be treated with all the confidence it deserves.

1. The renovation of benches has played a key role in promoting practical training among trainees.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

Give reasons for your answer

.....

2. The time allocated for practical training has proved inadequate for effective practice.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

What makes you think so?.....

.....

3. The fixing of vices appropriately has motivated you as a trainee to appreciate bench work practice.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

Why do you think so?.....

.....

4. The research study carried out was a step in the right direction regarding skills acquisition for us as trainees.

A) Strongly agree B) Agree C) Strongly disagree D) Disagree

Give reasons for your answer.....

.....

Questionnaire for Administrators

You are requested to answer this questionnaire by ticking or circling the appropriate answer and where necessary, give a brief explanation to defend your answer.

Do not write your name on the questionnaire and all information given here will be treated with all the confidence it deserves.

1. Practical training has improved in the Fitter Machinist section because of the renovated benches; it is the intention of the institute to purchase more benches to maintain the status quo.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

2. The fixing of vices in the section has had some impact on bench work practice among trainees, but this process can only be fully transformed when there are enough vices for all trainees.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

3. Time for practical training has of recent proved too short following the renovation of the equipment; as such, training may extend to weekends.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

4. This research study has enhanced skills acquisition in the section, as an administrator, I do encourage similar studies in the institute.

A) Strongly agree. B) Agree. C) Strongly disagree. D) Disagree.

Why do you think so?.....

.....
.....