UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION

UTILISATION OF HEALTH AND SAFETY MEASURES AMONG STUDENTS IN MECHANICAL WORKSHOPS OF TECHNICAL SCHOOLS- CASE STUDY OF ASUANSI AND CAPE COAST TECHNICAL INSTITUTES

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A Dissertation in the Department of Mechanical Technology, Faculty of Technical and Vocational Education, submitted to the School of Research and Graduate Studies, University of Education, Winneba, in partial fulfilment of the requirements for the award of the of Master of Technology Education in Mechanical Technology degree

AUGUST, (2016)

DECLARATION

STUDENTS DECLARATION

I, KWEKU AMPONSA-DADZIE, declare that this dissertation, with the exception of quotations and references contained in published works which have all been identified and acknowledged, is entirely my own original work and that it has not been submitted, either in part or whole, for another degree elsewhere.

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines and supervision of the dissertation laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: STEPHEN K. AMOAKOHENE

SIGNATURE:……

DATE: ……

ACKNOWLEDGEMENTS

I am highly indebted to the Lord Almighty God for His abundance Grace and the invaluable wisdom bestowed on me throughout this study period.

I render a very big thanks to my supervisor, Mr. Stephen. K. Amoakohene for taking pain and devoting his precious time to read through this dissertation. May God richly bless him.

DEDICATION

This piece of work is dedicated to my wife Mrs Grace Belinda Amponsa-Dadzie, my children, Efua, Fiifi and Araba

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LIST OF ABBREVIATIONS

GDP	-	Gross Domestic Product
H & S	-	Health and Safety\
ILO	-	International Labour Organization
OHS	-	Occupational Health and Safety
SMS	-	Safety Management System
TLM	-	Teaching and Learning Materials.
TVET	-	Technical and Vocational Educational Training
UNESCO	-	United Nation Educational, Scientific and Cultural Organization
WHO	-	World Health Organization

ABSTRACT

The general objective of this study was to investigate the utilization of health and safety measures among students of Asuansi and Cape Coast Technical Institutes. This study employed descriptive method to gather the relevant data obtained from the research area. The study used quantitative research approach for the study. The population for the study was 100. The population was made up of mechanical engineering students at Asuansi Technical and Cape Coast Technical Institutes. Purposive sampling technique was used to select 100 participants for the study. Primary and secondary data were used for the study. Primary data for this study was collected using questionnaires. The instruments were administered by the researcher in person. The data obtained from the respondents was analysed using the Statistical Package for Social Sciences version (SPSS v 16). The study results concluded that it is important to wear eye protection when hammering in the workshop. Moreover, students are aware that it is not important to operate a machine at the shop anytime they want. Also, it is important to wear gloves when handling hot objects. Furthermore, it is not good to crack jokes at the mechanical workshops, because cracking jokes does not make people work faster. The study also concluded that, it is good to clean workshops frequently to ensure safe working conditions and machines must be stopped before greasing them. To add more, students are aware that, attachments and clamps on the milling machine should be checked for tightness before turning on the machine, the best way to remove metal cuttings or chips from your work is to use a rag. The study recommended that the Ghana education service, through the District Education Directorate should organize periodic demonstration workshops and seminars to educate technical students regarding the safe use of tools and instruments to improve safety at the mechanical workshops.

CHAPTER ONE

INTRODUCTION

This chapter unveils the context for a research study into the utilisation of health and safety measures among students in mechanical workshops of technical schools by providing background to the study that relates to the need for good health and safety environment in these institutions in particular and safety consideration in the work environment in Ghana in general. The advancement of Asuansi Technical and Cape Coast Technical Institutes which are selected for the study has also been provided as background to the study that seeks to examine the utilization of health and safety measures in Ghana Technical Institutes.

1.1 Background to the study

Adherence of safe working skills and attitudes is paramount in the training of students who will become part of the labour force in the near future in Ghana. However, dangerous situations and possible health hazards, which may lead to accidents and injuries exits in all areas of public educations institutions, on matter the precautions taken by instructors and administrations to prevent accidents. The situations in vocational and technical institutions are more serious as compared to other kinds of institutions because students in vocational and technical institutions are often exposed to dangerous situations and possible health hazards as they handle both light and heavy duty machines at the workshop.

The duties of today's educator must include, not only imparting knowledge and experience, but also to be constantly alert to possible danger zones and take measures to reduce the likelihood of accidents. Ignorance, carelessness, and apathy have been found to be contributing to accidents in most cases. To address problems of carelessness and

apathy, each person involved in an activity in every sphere of life must have a vested interest in his or her own personal safety and the safety of those around him or her.

Thygerson as cited in Witty (1981), points out that inasmuch as the accident rate in society has not declined, there is a need to re-examine teaching techniques for accident reduction in schools. The school has been the first training grounds for safety measures for most people. According to Shashack (2002), the long-term objective of safety instruction is very important. Safety attitude acquired and developed during schooling, serve as the foundation for safe or unsafe behaviour and this goes a long way to affect the performance of students when they join the labour force. Strict adherence to safety measures is something that teacher must instil in students of technical and vocational education and training (TVET) institutions so as to make it a worthwhile habit.

Since the TVET institutions are responsible for training people in various vocations, it is necessary that these institutions produce for the nation, graduates who are highly challenged and always poised to work in a safe environment with good safety attitude. According to Williams, as cited by Gliem and Miller (1993), when public school administrators first undertook the obligation of providing shop and laboratory experiences for youth and adults enrolled in their schools, they assumed a responsibility to provide an accident-free environment and a program of instruction which would include emphasis on effective safety practices.

It is unlikely that a safety culture can be established overnight. Given sufficient effort, it will evolve over time. For a young developing country like Ghana, it is necessary that all technical and vocational schools make efforts to promote safety culture.

According to Stranks (2006), the term 'environment' is of French origin meaning "the surroundings or that which surrounds us". The duty of every vocational and technical education principal or administrator is to provide and maintain a working

environment for his or her teachers, students and non-teaching staff as well as visitors. That is the principal must ensure that the working environment is reasonably safe without risks to health. This requires that adequate facilities and arrangements are provided at the work place for the welfare of every person.

In any work situation, the working environment covers a broad range of safety issues. These include the design of the workplace, structural arrangements, and control over environmental stressors, such as extremes of temperature, poor lighting and inadequate ventilation. Others are the provision and maintenance of a range of welfare amenities such as sanitation, washing facilities, and prevention of overcrowding of workshops.

According to Stranks (2006), most organizations incorporate in their safety arrangements a chain of command from the most senior people down to employees. Fundamentally, orders pass down the system and information passes back up the system to create safety awareness. There are many factors which influence the way people behave at work, particularly with regard to the operation of safe procedures, the use of personal protective equipment, and the correct use of hazardous substances. A number of organizational characteristics also influence safety-related behavior. They include:

1. The promotion of a positive safety climate in which health and safety is seen by both management and employees as being fundamental to the organization's day-to-day operations, that is, the creation of a positive safety culture;
2. The need to ensure that policies and systems which are devised for the control of risk from the organization's activities take proper account of human capabilities and fallibilities; Commitment to the achievement of progressively higher standards which are demonstrated at the top of the organization and cascaded through successive levels of same;

3. Demonstration by senior management of their active involvement, thereby galvanizing managers throughout the organization into action; and
4. Leadership where an environment is created which encourages safe behavior (Stranks, 2006. p250)

Stranks (2006) has noted that developing and promoting the right safety culture within an organization involved changing people's attitudes, commitment at all levels and the promotion of health and safety as an important feature of the management system. The Health and Safety general of UK (as cited in Rimington, (l989) outlines the main principles involved in the establishment of a safety culture as follows:

1. the acceptance of responsibility at and from the top, exercised through a clear chain of command, seen to be actual and felt throughout the organization;
2. a conviction that high standards are achievable through proper management;
3. setting and monitoring of relevant targets/objectives, based upon satisfactory information systems;
4. systematic identification and assessment of hazards and the devising and exercise of preventive systems which are subject to audit and review; in such approaches, where particular attention is given to the investigation of error;
5. immediate rectification of deficiencies; and
6. promotion and reward of enthusiasm and good results.(Rimington, 1989)

Parliament of the Republic of Ghana in 2003 passed the labour Act, 2003(651) which became active on the 8th of October 2003. Section 10 of the Labour Act 2003 deals with rights of a worker and makes working under satisfactory, safe and healthy conditions a right of the worker. However, since all rights go with some amount of responsibility the worker has been charged with the duty to take all reasonable care for the safety and health of fellow workers.

Part XV of labour Act 651 deals specifically with occupational health and safety conditions under section 118 and states as follows:

1. It is the duty of an employer to ensure that every worker employed by him or her works under satisfactory, safe and healthy conditions
2. Without limiting the scope of subsection (1), an employer shall
   (a) provide and maintain at the workplace, plant and system of work that are safe and without risk to health;
   (b) ensure the safety and absence of risks to health in connection with use, handling, storage and transport of articles and substances;
   (c) provide the necessary information, instructions, training and supervision having regard to the age, literacy level and other circumstances of the worker to ensure, so far as is reasonably practicable, the health and safety at work of those other workers engaged on the particular work;
   (d) take steps to prevent contamination of the workplaces by, and protect the workers from, toxic gases, noxious substances, vapours, dust, fumes, mists and other substances or materials likely to cause risk to safety or health;
   (e) supply and maintain at no cost to the worker adequate safety appliances, suitable fire-fighting equipment, personal protective equipment, and instruct the workers in the use of the appliances or equipment;
   (f) provide separate, sufficient and suitable toilet and washing facilities and adequate facilities for the storage, changing, drying and cleansing from contamination of clothing for male and female workers;
   (g) provide adequate supply of clean drinking water at the work-place; and
   (h) Prevent accidents and injury to health arising out of, connected with, or

occurring in the course of, work by minimizing the causes of hazards inherent in the working environment.

The Act further states in section (3) that it is the obligation of every worker to use the safety appliances, fire-fighting equipment and personal protective equipment provided by the employer in compliance with the employer's instructions. In this regard the worker has been made to understand that the employer shall not be liable for injury suffered by a worker who contravenes subsection the provisions where the injury is caused solely by non-compliance by the worker.

It is not out of place for the school and for that matter the TVET institution to be identified as the first training grounds on matters of safety as the very students of today will be tomorrow's workforce. The first step and perhaps the most important step in achieving that goal is safety instruction. Many experts believe that such instruction should be presented to the student before he/she welds the first piece of metal, turns a bar on the lathe, cuts the first board, or places the first wrench to an engine.

Currently, there are 45 public technical institutes in Ghana which are administered by the Ghana Education Service on behalf of Ministry of Education. These institutes are spread over the ten regions in Ghana. For the reason of budget limitation and the purpose of this study as a project for masters' dissertation, it was not possible to cover all 45 technical institutes and include all the ten regions in the study. Asuansi Technical Institute (Asu Tech) and Cape Coast Technical Institute (Cape Tech) both in the Central Region of Ghana are selected for this study.

1.2 Statement of the Problem

According to Bill and Poston (1982), at the dawn of the 20th Century, more than 50 of every 100,000 workers were accidentally killed on the job. It is estimated that the figure could have been lesser if good safety practices were in place. When public school administrators first undertook the obligation of providing shop and laboratory experiences for youth and adults enrolled in their schools, they assumed a responsibility to provide an accident- free environment and a program of instruction which would include emphasis on effective safety practices.

The observation stated above indicates that, regardless of the emphasis upon health and safety practices in industry and modern schools, accidents still occur. The school curricula have expanded to include more occupational and technical training and so, the potential for situations that contribute to accidents have increased, especially in the technical institute (Kigin. 1983).Therefore the concern of good health and avoidance of risk, as well as the issues of ensuring safety and healthy environment become very critical consideration if not demanding in technical institutes.

Ever since the new machines and equipment were installed in the mechanical workshops of technical institutions in the country, no studies have been conducted in these institutions to investigate the utilization of safety measures by students. Furthermore, despite occasional reports of accidents at the workshops every term, there have been no special programmes to train the students to be aware and willing to utilise safety practices. In 2008/2009 academic year, a student in Asuansi Technical Institute lost his finger at the mechanical workshop and in 2010-2011 academic year, a student in the mechanical department of Cape Coast Technical Institute lost one eye through negligence of safety precautions. It is against this background of lack of studies on awareness and willingness of safety utilization measures in Ghanaian institutions that

this study was designed. It is important for every student to realize that the "right way to perform any task is the safe way", and this attitude leads to reduction in ones proneness to accident in school and also in their life after school.

1.3 Purpose of the Study

The main purpose of the study was to assess the utilization of health and safety measures among students in mechanical workshops of technical schools, using Asuansi and Cape Coast Technical institute as a case study.

1.4 Objectives of the study

The general objective of this study was to investigate the utilization of health and safety measures among students of Asuansi and Cape Coast Technical Institutes. The specific objectives were to:

1. find out whether students of Asuansi and Cape Coast Technical have any knowledge about safety precautions in the institute mechanical workshop.
2. examine the extent to which students of Asuansi and Cape Coast Technical institutes utilize health and safety guidelines in the institute's mechanical workshop.
3. determine the level of awareness of the safety equipment available in the school workshop of the Institute.

1.5 Research Questions

The research questions that will guide the study are:

1. To what extent do the students of Asuansi and Cape Coast Technical Institute have knowledge about health and safety practices in institute mechanical

workshop?

2. To what extent do students of Asuansi and Cape Coast Technical institutes utilize health and safety guidelines in the institute mechanical workshop?

3. What is the level of awareness of students of Asuansi and Cape Coast Technical institute regarding the safety equipment within the institute workshop?

1.6 Significance of the study

In the school situation, the instructor and school administrators have the legal responsibility for accidents that involve students or visitors while they are within the school setting. Regardless of the various persons who may be held legally responsible for the health and safety of students and others in the school setting, the ultimate responsibility for an effective safety program rests heavily upon each teacher. The findings of this study will help to know to some degree the true picture of safety attitude and culture existing in the technical Institutes. This will help teachers to advice remedial measures to help students develop appropriate safety attitudes (if necessary).

The study will be useful to other institutions; it will serve as a springboard for other institutions to undertake similar studies. The study could also provide new ideas for heads of departments in the technical institutes which may encourage them to recommend for in-service training for teachers. It could increase the awareness of educational administrators towards policy formulation and the strategies to put in place for accident free and healthy environment. The study would be useful to curriculum developers to decide on the appropriate learning experiences in line with the finding of the study.

1.7 Scope of the Study

The study evaluated the utilization of health and safety measures among students in mechanical workshops of technical schools, using Asuansi and Cape Coast Technical institute as a case study. Therefore, the study was geographically limited to Asuansi and Cape Coast Metropolitan. Moreover, the study was conceptually limited to utilization of health and safety measures.

1.8 Limitations of the study

The researcher encountered challenges during the gathering of primary data. The respondents were reluctant to disclose certain information because they fear they could be identified. The researcher assured them that the study was for academic purpose only and that anonymity is assured. On the other hand, the headmaster's of the respective schools also feared that the outcome of the study will tarnish the image of the schools. Therefore, they were also reluctant to allow students to participate in the study. The researcher clarified these thoughts and they were willing to correspond.

1.9 Organization of the Study

The study was organized into five chapters. Chapter one explained the rationale and motivation for the study and also presents the objectives, research questions, significance and the limitations. Chapter two was on review of related and relevant literature. The methodology used to carry out the study was presented in chapter three with chapter four dealing with the presentation and interpretation of the results. The final chapter, chapter five discussed the results with fixable recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a look at the utilisation of health and safety measures among students in mechanical workshops of technical schools. The study reviewed related literature about health and safety.

2.2 Theoretical Framework of the Study

This section contains theories of safety management

2.2.1 Theories of Accident causation

Safety involves both people and technology. People are involved because they experience injury or are involved with making technology work. Technology produces risks from the design of the machine or the process itself. People will have certain attitudes towards safety, for example some people, and consider it fun to drive fast or to have control of a car whilst under the influence of drink. Technology involves the safety of the procedure itself rather than the attitudes of the people carrying out the procedure. Safety can be considered from the perspective of the way people act and from the engineering of the equipment being used. There are a number of models that have developed out of these two basic ideas. A number of theories have been developed based on the idea of "if we can get the technology right we can control the risks" whilst others feel that "we must get the people's attitudes right". There are several major theories concerning accident causation, each of which has some explanatory and predictive value.

1. The domino theory developed by H. W. Heinrich, a safety engineer and pioneer in the field of industrial accident safety.

2. Human Factors Theory
3. Accident/Incident Theory
4. Epidemiological Theory
5. Systems Theory
6. The energy release theory, developed by Dr. William Haddon, Jr., of the Insurance Institute for Highway Safety.
7. Behavior Theory

2.2.2 Heinrich's Domino Theory

The domino theory is heavily oriented towards the human approach and was formulated by Heinrich (2010). He carried out detailed research into the cause of accidents and found that approximately 88% of them were as a result of unsafe acts committed by human beings. The remaining 12% were caused by technological factors. From these observations, he developed the domino theory. Heinrich considered that there were a number of factors that contribute to an accident. These could be likened to a number of dominoes standing in a row—if one is knocked down the remainder also fall Remove one of these dominoes and the possibility of a loss occurring is reduced.

In his view, there are four dominoes that lead to an accident:

1. The social environment.
2. The fault of the person.
3. The unsafe act.
4. The injury itself.

Social environment: individuals are brought up in a particular environment. Some people have little concern for their own or other people's safety-they may consider it hard to take chances. This could be argued to be a result of the culture of the society or

organisation in which the individual is situated.

The fault of the person: this means that the person has particular tendencies to enter into unsafe situations. The psychological make-up of the person may lead him or her to deliberately do something that is unsafe, perhaps because he or she has not absorbed training given or is unaware that he or she is carrying out an unsafe act. It is the person who is at fault—that person's psychology—as opposed to society's effect on the person concerned.

The unsafe act: this is the actual act that leads to the injury, such as the loss of balance while riding a bicycle or the failure to secure the door of one's house so that no dangerous animal enters.

The injury itself: this is an injury to the person or to property

Adapted from Accident Theories by Work Zone Safety and Efficiency Transportation Center, Cleveland State University, (2010)

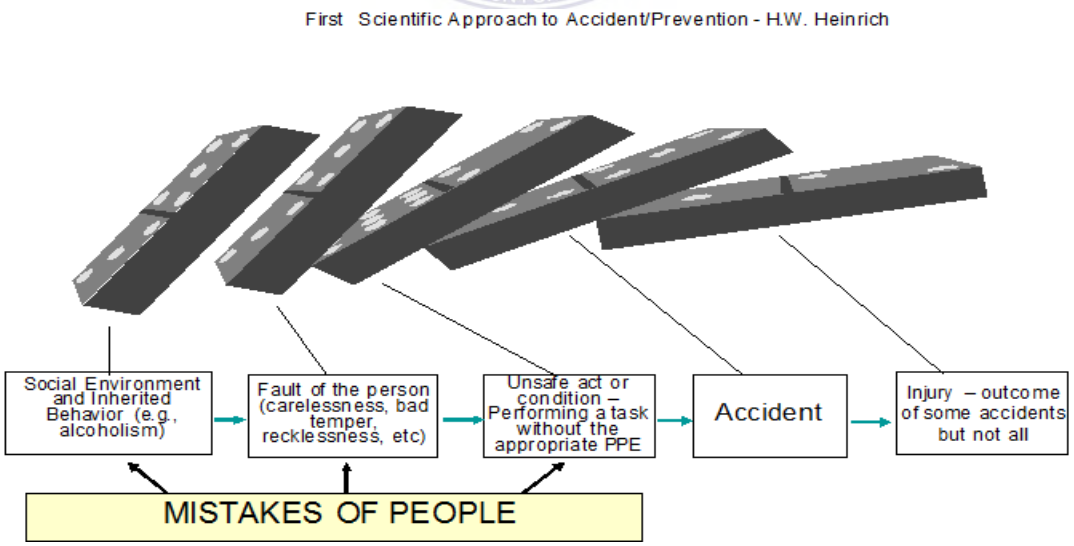

Fig 2.1 First Scientific Approach to Accident/Prevention

Source: Heinrich (2010).

Heinrich's Dominos - The Process

Heinrich identified three critical issues that need consideration in the discussion of accidents. These are:

1. A personal injury (the final domino) occurs only as a result of an accident.
2. An accident occurs only as a result of a personal or mechanical hazard.
3. Personal and mechanical hazard exist only through the fault of careless persons or poorly designed or improperly maintained equipment.
4. Faults of persons are inherited or acquired as a result of their social environment or acquired by ancestry.
5. The environment is where and how a person was raised and educated.

2.2.3 Heinrich's Domino Theory -Critical Issues

Heinrich identified three critical issues that need consideration in the discussion of accidents. These are:

1. The factor preceding the accident (the unsafe act or the mechanical or physical hazard) and it should receive the most attention.
2. Heinrich felt that the person responsible at a company (school workshop) for loss control should be interested in all five factors, but be concerned primarily with accidents and the proximate causes of those accidents.
3. Heinrich also emphasized that accidents, not injuries or property damage, should be the point of attack.

2.2.4 Heinrich's Domino Theory-Corrective Action Sequence (The three "E"s)

Heinrich concluded his accident theory by proposing corrective measures that must be put in place to minimize accidents at the workplace. In his view, the measures should consider engineering, education and enforcement (the three E"s) as explained below.

1. Engineering

- Control hazards through product design or process change

2. Education

- Train workers (students)regarding all facets of safety
- Impose on management (teachers) that attention to safety pays off

3 Enforcement

- Ensure that internal and external rules, regulations, and standard operating Procedures are followed by workers (students) as well as management (teachers)

2.2.5 Multiple Causation Theory

According to Raouf (2008) the multiple causation theory is an outgrowth of the domino theory, but it postulates that for a single accident there may be many contributory factors, causes and sub-causes, and that certain combinations of these give rise to accidents. According to this theory, the contributory factors can be grouped into the following two categories:

- Behavioral. This category includes factors pertaining to the worker, such as improper attitude, lack of knowledge, lack of skills and inadequate physical and mental condition.

- Environmental. This category includes improper guarding of other hazardous work elements and degradation of equipment through use and unsafe procedures.

The major contribution of this theory is to bring out the fact that rarely, if ever, is an accident the result of a single cause or act

2.2.6 The Pure Chance Theory

According to the pure chance theory, every one of any given set of workers has an equal chance of being involved in an accident. It further implies that there is no single discernible pattern of events that leads to an accident. In this theory, all accidents are treated as corresponding to Heinrich's acts of God, and it is held that there exist no interventions to prevent them.

2.2.7 Biased Liability Theory

Biased liability theory is based on the view that once a worker is involved in an accident, the chances of the same worker becoming involved in future accidents are either increased or decreased as compared to the rest of workers. This theory contributes very little, if anything at all, towards developing preventive actions for avoiding accidents.

2.2.8 Accident Proneness Theory

Accident proneness theory maintains that within a given set of workers, there exists a subset of workers who are more liable to be involved in accidents. Researchers have not been able to prove this theory conclusively because most of the research work has been poorly conducted and most of the findings are contradictory and inconclusive.

This theory is not generally accepted. It is felt that if indeed this theory is supported by any empirical evidence at all, it probably accounts for only a very low proportion of accidents without any statistical significance.

2.3 Empirical Framework of the Study

2.3.1 Utilisation of health and safety measures

The WHO defines health as the complete state of physical, mental and social well-being not the mere absence of disease or infirmity (WHO, 2006). A joint definition of occupational health endorsed by the ILO and WHO (as revised in 1995) states that: *"Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the workers in an occupational environment adapted to their physiological and psychological capabilities; and, to summarize : the adaptation of work to man and of each man to his job"* (WHO, 1995: 3). Occupational Health and Safety (OHS) refers to the outcome of adequate protection of a worker from sickness, injury and disease arising from work (ILO, 2003). The purpose of OHS is to provide safe working environment for all employees and workers in every organization irrespective of size, sector or industry. The outcome of such practice and compliance with OHS guidelines at every workplace and environment directly and indirectly impacts productivity as well as performance. Thinking beyond the benefits for both the organization and the country, it is worthy of note that the providing a safe and healthy working environment for workers is a right which is tied to employees fundamental right of "right to live a healthy life". Effective implementation of OHS in

organizations will thwart both fatal and non-fatal accidents as well as illnesses at the work place there ensuring the welfare of the entire workforce. According to the International Conference of Labour Statistics (1998), occupational accident could also be defined as an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death. Occupational injury according to the ILO, (2003), is defined as "death, any personal injury or disease resulting from an occupational accident" whiles Occupational disease is defined as "a disease contracted as a result of an exposure to risk factors arising from work activity".

2.3.2 The Problem of Occupational Injuries, Illness, and Deaths

In their article on "occupational health and safety: key issues and concerns in Ghana" Amponsah-Tawiah and Dartey-Baah reckon what former UN Secretary General, Kofi Annan said " *Safety and health at work is not only a sound economic policy - it is a basic human right".* Just as many of the human rights that are abused every day, even though right of life is a fundamental human right, yet the International Labor Organization reports there is 2.2 million people are deprived of that right by occupational accidents and work related diseases (ILO, 2005). Worse yet, a further estimate of 270 million workers suffer occupational accidents and about 160 million occupational diseases annually (ILO, 2014; ILO, 2005). Of course these alarming statistics may only be underestimation because there is underreporting and unavailability of data in most developing countries on non-fatal illness and injuries at the workplace (Probst, Brubaker, & Barsotti, 2008; DCPP, 2007).

In addition, the DCPP (2007) estimates that about 10 million cases of Disability-Adjusted Life Years (DALYs) lost, or healthy years of life lost whether to disability or premature death can be attributed to occupational injuries alone, and 8% of unintentional injuries globally result from occupational injuries as well (DCPP, 2007). The impact of the general problem of poor occupational health cannot be underestimated too. For instance it is estimated that reduced working capacity of workers may cause economic loss up to 10-20% of the Gross National Product of a country (WHO, 1994), a figure that differs from country to country and from region to region. It is further estimated that about 4 percent of Gross Domestic Product (GDP) is lost due to occupational deaths, diseases, and illnesses (Takala, 2002).

It is worse in some countries as the cost of such injuries even reaches as much as 10 percent of their GDP (International Social Security Administration, 2014). In monetary terms, according to the International Labour Organization, the direct or indirect cost of occupational illness and accidents at work is estimated at US$2.8 trillion worldwide (ILO, 2014).

2.4 Occupational Health and Safety Policies In Ghana

The Occupational health and safety legislation is a means by which the work environment can be controlled to ensure the safety, health and welfare of employees so as to ensure that persons likely to be undesirably affected by the work environment are safe (Kheni, 2008). The British‟s legal and institutional framework governing OHS was the foundation for Ghana‟s OHS legislation. The health and safety of workers in the mining and wood processing industries of Ghana prior to independence, was protected by the Factories Ordinance 1952. However, this was repealed and replaced with

Factories, Offices, and Shops Act 1970. There were other regulations which were operational under the Factories Ordinance 1952 and they included:

- The Factories (Woodworking) Regulations, 1959;
- The Food Factories (Welfare) Regulations, 1959; and
- The Factories (Docks Safety) Regulations, 1960.

Moreover, Ghana's OHS legislation is largely based on the International Labour Organization (ILO) policies. It is out of the ILO policies and conventions that Ghana has ratified some principal ones relating to OHS. Among such are:

- Underground Work (Women) Convention 1935 (No. 45);
- Radiation Protection Convention 1960 (No. 115);
- Guarding of Machinery Convention 1963 (No. 119);
- Hygiene (Commerce and Offices) Convention 1964;
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977; and,
- Labour Inspection Convention 1947.

According to the Ghana Labour Act passed in 2003, (Act, 651) all employers in the country are required to provide maximum assurance that ensures their employees are unexposed to conditions that has the potential of causing work related injuries and illnesses. On the other hand, employees are also required to be compliant in ensuring conformance to employers‟ operating standards. This provides a level ground for both the employers and employees to enjoy the benefits of safe and healthy working environment. There are series of policies that directly or indirectly govern occupational health and safety in Ghana, however, these are fragmented. It is the same with the agencies that regulate and monitor OHS activities in the country; there is no single

national body or policy solely dedicated to championing the OHS of employees in the country. The fragmentation is such that ministries, agencies and other authorities are charged with ensuring that specific activities and guidelines are put in place to provide a safe and healthy environment for employees. For instance, the Minerals Commission has the Mining Regulations (1970) which remains the main OHS guide for the mining industry. On another hand, Road Safety Commission oversees the policies regarding health and safety of workers in the transport industry as well as pedestrians, other agencies such as Environmental Protection Agency, Standards, Authority etc., all have distinctive roles to play in the OHS management in Ghana. The problem is that the fragmentation and absence of a unified body and policy makes focus on OHS implementation and overall management difficult.

As Annan (2010) noted many work-related injuries, illness and damages occur at the workplace however, absence of thorough standard, unfamiliarity with existing policies leads to under reporting or misclassification; thus many people are normally not in the known of such events their consequences and the necessary corrective actions to be taken.

On another front the Provisional National Defence Council (PNDC) government passed the Workmen's Compensation Law in 1987 to be a policy for providing compensation for work related injuries suffered by employees at their workplaces; to abate or prevent any form of financial burden to their organizations, employers put in measures to ensure that such work-related accidents and illnesses are absent or minimal which impacts OHS. Other OHS policies under different jurisdiction include the Radiation Protection Board of the Ghana Atomic Energy Commission is also proactive in monitoring companies with radiation exposure hazards for compliance. Additionally, the Environmental Protection Agency (EPA) Act, 1994 (Act 490) the Ghana Health

Service and Teaching Hospital Act 526, 1999 and the National Road Safety Commission Act 567, 1999.

2.5 The Ghana Labour Act

The Part XV of the Ghana Labour Act, 2003 (Act 651) concerns the health and safety and environment of workplaces. It therefore mandates all employers to guarantee employees work under satisfactory, healthy and safe conditions. Protection of employment relationship; general conditions of employment; protection of remuneration; unions; employer's organisations and collective bargaining agreements; National Tripartite Committee; and, labour inspection are other sections of the Act that have impact on health and safety (Kheni, 2008).

The Labour Act, 2003 (Act 651) specifies that every employer is required to do the following;

- Provide and maintain at the workplace, plan and system of work that are safe and without risk to health.
- Ensure that safety and absence of risks of health in connection with use, handling, storage and transport of substances.
- Provide the necessary information, training and supervision with regard to age, literacy level and other circumstances of the worker to ensure the health and safety at work of other engaged workers.

This is a legal requirement that must be adhered to by all employers in the country. In the event where some employers fail to comply with the above, the government imposes sanctions and in some situations fine on such employers. According to the Act, any employer that is noncompliant without justifiable reason commits an offence; and such entity is liable to an instant fine not exceeding 1000 penalty units or

imprisonment of a term not exceeding three years or both (Ghana labour Act, 2003). Furthermore, the International Labor Organization's commitment to ensuring the safety of all workers of its member states is reflected in some targets and indicators that member countries must meet. The targets include:

- Improved policies, legislation, coverage (legal, inspection, compensation, occupational health service)
- Availability of occupational health services
- Improved safety and health infrastructure and qualified manpower
- Better statistics, higher visibility on safety and health
- Establishment of advisory bodies and voluntary mechanisms
- Targeted national programme using measurable indicators

2.6 Ghana's Factories Offices and Shops Act, 1970 (Act 328)

Passed in 1970 this law seeks to regulate the formal sector employment in the country and provide OHS guidelines as well. By the Act it is expected that employees update themselves with the guidelines and comply with them as well with the goal of reducing risks, injuries and illness at the workplace. In the event of workplace accident, there is a guide for what action to be taken and the sanction that the employer also will face. To ensure sanity and compliance the Act appoints chief safety inspectors who have the power and mandate guarantee safety of workers in factories, offices and shops in Ghana. These chief safety inspectors are obliged:

- To enter, inspect and examine, by day or by night, a factory and every part thereof, when he has reasonable cause to believe that any person is employed there in, and to enter, inspect and examine by day any place which he has reasonable cause to believe, to be a factory, office or shop, and any part of any building of which a factory, office

or shop forms part and in which he has reasonable cause to believe that explosive or highly inflammable materials are stored or used.

- To take with him a police officer if he has reasonable cause to expect obstruction in the execution of his duty
- To require the production of the registers, certificates, notices and documents kept in pursuance of this Act and to inspect, examine and copy any of them.
- To make or cause to be made such examination and inquiry as may be necessary to ascertain whether the provisions of this Act and of the enactments in force relating to public health are complied with so far as it respects a factory, office or shop and any persons employed therein.
- To require any person who he finds in a factory, office or shop to give information
- To examine or cause to be examined any person, either alone or in the presence of any other person, as he thinks fit, with respect to matters under this Act.
- In the case of an Inspector who is a registered medical practitioner, to carry out such medical examinations as may be necessary for the purposes of his duties under this Act; and
- To exercise such other powers as may be necessary for carrying this Act into effect.

2.7 Health and Safety in TVET institutions

Health and safety issues in TVET are not well-researched but there are signs of increased impact on job satisfaction and teaching capacity due to stress and student indiscipline in some mainly high-income countries. As in many domains addressed in this report, the evidence base on health and safety issues in TVET is thin. A few countries such as Finland have reported concerns over high levels of stress among TVET teachers (CEDEFOP, 2009: 108). In general education, the climate of insecurity, even violence,

in classrooms and learning sites has been growing in recent years as changes in social norms, the demographic make-up of student populations and technology (Internet-based cyber bullying) undermines teacher authority, respect and inevitably a safe and quality learning environment. High profile cases of school violence in TVET settings in normally stable, high-income countries such as Finland and Germany in recent years only underscore the potentially explosive nature of such violence. Far more common is that recorded in the daily working environments of TVET teachers and trainers.

An official career publication in the United States has highlighted these difficulties, with TVET teachers facing unruly students, violence, stress and isolation in classrooms. Aside from the disruption such an environment produces on learning outcomes, there is little information available to indicate that either sporadic, high-profile violence or more recurrent, low-level forms have a deep-seated impact on TVET recruitment, retention or motivation. According to the International Labour Organisation (2005) estimates, 250 million work accidents occur annually while 160 million are estimated to suffer from work-related illnesses. About 1.2 million die due to such accidents - a death toll averaging some 5,000 workers a day.

2.7.1 Health and safety in the statutes laws of Ghana

General health and safety conditions.

1. It is the duty of an employer to ensure that every worker employed by him or her works under satisfactory, safe and healthy conditions
2. Without limiting the scope of subsection (1), an employer shall
    a. provide and maintain at the workplace, plant and system of work that are safe and without risk to health;
    b. ensure the safety and absence of risks to health in connection with use,

handling, storage and transport of articles and substances;

c. provide the necessary information, instructions, training and supervision having regard to the age, literacy level and other circumstances of the worker to ensure, so far as is reasonably practicable, the health and safety at work of those other workers engaged on the particular work;

d. take steps to prevent contamination of the workplaces by, and protect the workers from, toxic gases, noxious substances, vapours, dust, fumes, mists and other substances or materials likely to cause risk to safety or health; supply and maintain at no cost to the worker adequate safety appliances, suitable fire-fighting equipment, personal protective equipment, and instruct the workers in the use of the appliances or equipment; provide separate, sufficient and suitable toilet and washing

e. facilities and adequate facilities for the storage, changing, drying and cleansing from contamination of clothing for male and female workers;

f. provide adequate supply of clean drinking water at the work-place; and

g. prevent accidents and injury to health arising out of, connected with, or occurring in the course of, work by minimizing the causes of hazards inherent in the working environment.

1. It is the obligation of every worker to use the safety appliances, firefighting equipment and personal protective equipment provided by the employer in compliance with the employer's instructions.
2. An employer shall not be liable for injury suffered by a worker who contravenes subsection (3) where the injury is caused solely by non-compliance by the worker.

3. An employer who, without reasonable excuse, fails to discharge any of the obligations under subsection (1) or (2) commits an offence and is liable on summary conviction to a fine not exceeding 1000 penalty units or to imprisonment for a term not exceeding 3 years or to both.

Exposure to imminent hazards

1. When a worker finds himself or herself in any situation at the workplace which she or he has reasonable cause to believe presents an imminent and serious danger to his or her life, safety or health, the worker shall immediately report this fact to his or her immediate supervisor and remove himself or herself from the situation.
2. An employer shall not dismiss or terminate the employment of a worker or withhold any remuneration of a worker who has removed himself or herself from a work situation which the worker has reason to believe presents imminent and serious danger to his or her life, safety or health.
3. An employer shall not require a worker to return to work in circumstances where there is a continuing imminent and serious danger to the life, safety or health of the worker. Employer to report occupational accidents and diseases.
4. An employer is required to report as soon as practicable as and not later than seven days from the date of the occurrence to the appropriate Government agency, occupational accidents and diseases which occur in the work place. (Labour Act of Ghana, Act 651).

2.8 Measurement of Health and Safety Conditions at Work

According to Giovanis (2010) the measurement and evaluation of an organization's performance on health and safety conditions at work (H&S) mainly aims at the provision of information about the current situation and the progress of the strategies, processes and activities that are adopted by an organization with the view to keep H&S hazards under control.

A key division of safety performance indicators is based on their timing, (i.e. their measurement either before or after the incident). In this case, we talk of proactive assessment, which monitors the achievement of certain preventive objectives and the progress of certain programs to improve safety, and for subsequent monitoring, which records the "failures" of the system, such as any kind of losses, accidents and illnesses and the related financial cost.

Safety, according Powell, as cited in Giovanis (2010) is a notion which refers to the activities whose aim is the hazard reduction (hazard is defined as the possibility to have a non-desirable event) and the decrease of the consequences that are caused by the non-desirable events; however, it concerns a notion that also includes the personal assessment of hazard. Safety seems to defy one single definition and as result has been defined, differently by various authors as:

- The state of being safe, namely the lack of hazard, injury or loss (Webster, 1989)
- The possibility of experiencing non-desirable consequences caused by a certain event(Rowe, 1977)
- The relative protection from exposure to hazards (Hammer, 1981)
- The opposite of hazard (Harms-Ringdahl, 1993)
- The appropriate handling of a substance or carrying out of an action with the view to efface the possibility of causing an injury or damage (Confer and

Confer, 1994)

- The lack of hazard that could cause damage (Van Steen, 1996).

Giovanis (2010) has observed that because of the various definitions that are given to the notion of safety, it is difficult to give a one-way definition to the safety measurement. In the effort to combine some of the above definitions, we accept that safety measurement deals with the quantity and quality of the activities that aim at the hazard reduction, as well as the quantity of the non-desirable events.

In the international literature, the term safety performance evaluation is more frequently used as it gives a better meaning to the measurement quality dimension. Each measurement system or safety performance evaluation system use one or more safety performance indicators which are sometimes identified, at a semantic level, with the measurement method (e.g. unsafe behaviours observation) and, other times, are used in terms of measurement size (e.g. incident frequency, namely the number of incidents per 100.000 man-hours).

2.8.1 Categories of Safety Performance Indicators

Goal determination (determination of what is wanted) has been seen by Grimaldi and Simmonds (1989) as the most important step towards the development of the safety performance indicators. Two goals, the incident prevention and the loss control are identified. Grimaldi and Simmonds (1989) emphasize that it is not enough for the performance indicators to provide reliable data on the safety programs effectiveness but there should also be a convincing prospect either through the cost-benefit analysis, or through incident indicators, or even through information regarding the degree of hazard of certain activities. The authors divide the safety performance indicators into organic and systemic, depending on their object. According to them organic indicators examine

the planning as well as the safety program implementation and include the safety inspection, the safety audit and benchmarking. The systemic indicators assess the programmes results and include the incident indicators, the incident cost, safety climate surveys and work sampling methods.

Petersen (1998) conducted another important division, *macro measures*, which assess the total effort that is made by an organization, and *micro measures*, which deal with the individual performance. Macro measures include incident data, survey results, probing of the staff's opinion. The individual indicators or accountability measures are divided in two categories: performance indicators and results indicators. The performance indicators are proposed for use in the lower and middle level of the hierarchy and concern activities that the safety management system (SMS) requires to be executed at these levels. The indicators results are proposed for use in the middle and upper level of the hierarchy and are based on "pre-incident" evidence, such as safety inspections and observations of safe behaviour, and on "post-incident" evidence, such as incident rates and the respective costs per unit.

Regarding *liability indicators,* Stricoff (2000) separates them from the performance indicators and argues that they are based on management-by-objectives and cannot be used as direct result indicators. Stricoff divides performance indicators on safety based on their timing, before or after the event and based on their validity. The aim is, according to the author, to identify indicators which are calculated before the event and have the utmost reliability. To determine this, he considers a theoretical model of the route to the incident, in which the starting points are hazards followed by hazard controls, exposure to hazard and finally the incident. The indicators relating to hazards are not considered significant since they ignore the existing safety measures. Safety inspections and other indicators concerning safety measures have a questionable

relationship with the reduction of exposure. The report is presented as an indicator of high validity, as it is directly proportional to the incident. For this reason, observations of safe and unsafe behaviour that are indicative of workers' exposure to hazards are proposed as useful indicators of safety performance.

A different approach, based on the principles of total quality, distinguishes three stages in the subject of safety, as regards quality, safety control, safety assurance and total safety management (Giovanis 2010).

According to Giovanis in the first control stage, results are evaluated mainly based on indicators of incidents. In the second phase of safety assurance, the management commits on safety objectives and these are implemented through standard safety management systems. The evaluation of performance and the system's inspection are incorporated in the SMS. In the third stage of total safety management, safety inspections, including the utilisation of safe conduct and inspections of the system are used as indicators of the system's quality. The investigations of staff attitudes towards safety are used to measure the safety climate (Giovanis 2010).

2.8.2 The Development of Safety Performance Indicators

Giovanis 2010 asserts that the development of standard management systems for occupational health and safety and their integration in the general administrative process of an organisation set additional requirements for measuring safety performance in an organization. On behalf of the International Labour Office (ILO, 2001), the International occupational Hygiene Association implemented an in-depth analysis of 24 international, national and local safety management systems, the conclusions of which were used to create the International Labour Office Guidelines on safety management systems (Newell, 2001).

The systems' analysis was conducted using a general safety management systems evaluation model, developed in the University of Michigan. According to this model, the development of reliable and valid methods for measuring safety performance require the establishment of indicators, variables, measurement units and their logical relationships. Of particular importance are the indicators that can anticipate emerging problems, where root-cause analysis is essential in their development.

1. In most safety management systems, the evaluation of performance is associated with the following stages: Planning and implementing, this defines the objectives, determining the desired performance through performance standards. The standards relate to:
    - what is entered in the system, i.e. the natural resources, human resources and information that enter the organisation
    - the system itself and more specifically the interaction between man and work, which includes the equipment, environment, materials and procedures.
    - what exits the system, i.e. the products or services, information and anything else that comes out of the organisation.
2. The monitoring phase, where performance is measured in relation to predetermined standards. The measurement takes place with the following methods:
    - proactive monitoring (active monitoring systems), which monitors the achievement of specific goals and standards
    - ex post monitoring (reactive monitoring systems), which examines any "failure" of the system, such as incidents, illnesses, losses, hazards, weaknesses or omissions in performance standards.
3. The review, which assesses the overall effectiveness of the system. The review requires a systematic, detailed audit of the system, which may be effected through a

"vertical incision' in the system considering each activity at each level of the system, or a "horizontal incision" in the system, which examines one system level (e.g. planning) or a combination of the above in depth.

2.8.3 Indicators of Accidents and Incidents

The most widespread indicators in this category are: the *incidence rate*, the *incident frequency rate* and the *incident severity rate.*

Safety Inspection and Audit

The *safety inspection* has been the main tool for maintaining safe conditions and monitoring unsafe practices from the time Heinrich formulated his theory on the causes of incidents and for many years thereafter (Petersen, 1998). The introduction of safety management systems created the requirement forth *safety audit,* which is a detailed examination and evaluation of all components of the system to ensure that they comply with prescribed standards. Safety audits may include: safety inspections, inspection of documents and interviews. In both methods, quantitative results can be used as indicators of an organization's safety and are both a measure of long-term monitoring and a way of evaluating staff attitudes on safety issues. However, both methods regard the organisation as a closed system, which, in the case of the safety inspection has the characteristics of a Taylor organizational approach, or, in the case of safety audits, adopts a socio-technical approach (Van de Kerckhove, 1998). Both methods provide a static picture and do not facilitate an in-depth understanding of the system's dynamics.

With respect to safety inspections, their advantages include the fact that they require the involvement of staff at all levels; that they provide a direct picture of the situation and reveal problems that must be corrected immediately and that they give a sense that safety

issues are “under control”. The disadvantages of safety inspections include the possible lack of knowledge or other shortcoming of the inspector that may lead to incorrect or incomplete results, the frequent repetition of issues that have either not been resolved or arise anew, which are gradually established as problematic situations that are finally accepted, and their failure to uncover the root causes that lead to these records, which are usually associated with organizational and administrative problems. With respect to safety audits, their main advantage is that they take place before any incident.

Performance in safety issues is quantified at each level of the organization and therefore may be part of any overall personnel and management evaluation system. As system audits (accounting, quality, environmental) are now accepted administrative tools, the management of an organization allocates time and money with greater ease to conduct such tests, thus demonstrating its commitment to safety issues in practice. Nonetheless, this same wealth of audits, especially in large organizations, has been found to diminish their importance, especially when they are repeated very often. The use of ready audit packages often does not cover all areas of activity in a particular organization, while the development of internal control systems in the organisation, apart from high costs, could lead to results that are difficult to compare with other organizations. Here too, as in safety inspections, the knowledge and experience of auditors determine the outcome.

2.9 Monitoring of Safe and Unsafe Behaviours at the workplace

The 80s saw the beginning of the use of applied behaviour analysis as a tool to improve performance in safety issues. It was greatly developed in the 90s, under the influence of the principles of Total Quality Management (Krause, 2001). The method is based on the recording of random samples of occupational behaviour and their

comparison with predetermined safe and unsafe behaviours. The setting of goals and the continuous feedback of employees with the findings of the recordings are key elements of behaviour-based safety programs.

The recording of safe and unsafe behaviour (behaviour sampling) in such a program, used for some time, may lead to change not only in behaviour but also in attitudes to safety, which indeed is the main advantage of this method. However, the description of all critical safe and unsafe behaviours (as the method requires) and the training of staff and observers regarding their identification, requires time, money and expertise and this is the main deterrent in implementing such programs. Moreover, as a relatively new method, its relationship with the reduction of incidents and overall performance in safety matters are still under investigation (Sulzer-Azaroff and Austin, 2000).

2.9.1 Exploring the Safety Climate

According to Giovanis (2010) in recent years the emphasis has shifted to a purely social approach, where in order to optimize the man-machine-environment system, we require the creation and maintenance of a positive safety culture. The concept of the safety culture was defined after the Chernobyl disaster, as the set of characteristics and attitudes at the level of organization and employee, which ensure that the safety of facilities is prioritised according to their importance (International Atomic Energy Authority - IAEA, 1986). *Safety climate* is a term used to describe how employees perceive safety in the organisation they work (Byrom and Corbridge, 1997).

According to Giovanis (2010) the measurement of the safety climate through questionnaires is a proactive method of evaluation that reveals information on elements of the safety management system that cannot be identified by other methods, such as the

level of communication, the commitment of senior management and the sustainability of the system. Moreover, the measurement before and after implementing a safety improving program can be an effective measure of its improvement.

Giovanis was of the view that the development of a questionnaire investigating the safety climate requires specialized expertise, as, if the guiding questions are unclear, they may lead to incorrect conclusions. In addition, the usually anonymous questionnaires are filled in by those who have a positive attitude towards safety and this view is reflected in their responses. Finally, the frequent use of such questionnaires may "tire" staff. It is generally considered that the measurement of the safety climate cannot replace other methods of assessing performance in safety issues, but rather complement these.

2.10 Conceptual Frame work of the Study

Effective safety and health management is an integral part of all TVET institutional activities. If TVET is to reflect contemporary technological practice, methods of safety planning should reflect what happens in technological practice and the relevant regulations and standards that underlie safe practice in the different technological areas. The conceptual framework guiding the study is based on managing health and safety of people in a TVET institution. It was adapted by the researcher from Stranks (2006). This framework helps to understand the processes needed for effective safety and health of students and teachers while they are involved in learning activities and also for that of people using their environment.

The concept of safety is an extensive concept that refers to the avoidance of any kind of accident leading to harm or injury to human beings (Piètre-Cambacérès & Bouissou, 2013). The concept is extensive and not limited in scope in that it is regarded

as encompassing accidents or incidents that cause minor physical injuries (bruise or small cut) as well as major injuries that demand intense hospital care or that may cause death (Mattson, 2015). Thus, the concept's emphasis on prevention and avoidance of harm call for understanding accident causes and prevention of new occurrences. Therefore health and safety issues are often concerned with improving the safety related behaviors of the workers (Smith, Karsh, Carayon, & Conway, 2003). Such behaviors according to Mattson (2015) include complying with safety rules and regulations, taking initiatives to contribute to the enhancement of safety at the workplace, and reporting all accidents and injuries that are experienced or found out about. This last behavior has been increasingly focused on in safety contexts, as findings show that a large number of accidents and injuries in organizations go by unreported (Probst, Brubaker, & Barsotti, 2008). Underreporting could negatively impact on the safety of an organization because it represents missed opportunities to improve safety by learning from mistakes (Mattson, 2015).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents information related to the population, research instrument and procedure for the collection of data. The study is about utilisation of health and safety measures among students in mechanical workshops of technical schools.

3.2 Profile of the Study Areas

Available records indicate that Asuansi Technical Institute (Asutech) was started as a military camp in 1917, and it was later converted to a technical school (Asuansi Technical Institute). It is called Asuansi Technical Institute because the school is situated on the land of Asuansi. Asuansi is in the Abura Asebu Kwamankese District of the Central Region of Ghana **(Asuansi Technical Institute 95th Anniversary Brochure).** The school is considered to be the first Technical School in Ghana. The population in the school as at 2016, comprises 1,265 students, 78 teachers and 55 non-teaching staff, with Mr. Ameyaw Baafi as the principal.

According to available records, Cape Coast Technical Institute (Cape Tech) was started as a private school by the late Joseph Kadesh Abraham of Cape Coast in the year 1955. (Cape Coast Technical Institute 60th Anniversary Brochure). The name of the school at that time was College of Architecture, and was later changed to Electrical Institute. It was again renamed Cape Coast Polytechnic. In 1975, the Ghana Education Service absorbed it and named it Cape Coast Technical Institute. The Institute started in a building around Cape Coast Kingsway. It moved to Savoy Hill, and then to Aquarium and finally moved to the present site at Abura-Pedu Village in Cape Coast. The initial population in 1995 comprised 10 students with two teachers. The population in 2016,

with Mr. Albert Edusei as the principal, comprises 1684 students, 85 teachers and 37 non -teaching staff.

Currently, Asuansi Technical Institute runs programmes in Mechanical Engineering Technology, Electrical Engineering Technology, Agricultural Mechanization Technology, Motor Vehicle Engineering, Welding and Fabrication, Technology, Building construction Technology, plumbing and Gas fitting Technology, Architectural Draughting Technology Creative Art Technology, Fashion Design Technology, Furniture Design and Construction, Wood Construction Technology, Business Accounting and Secretaryship and Information Technology.

Like most Technical Institutes in Ghana Cape Coast technical institute runs programmes which include Building Construction and Technology, Electrical Engineering Technology, Fashion Design and Technology, Mechanical Engineering Technology, Motor Vehicle Engineering, Electronics/Electrical, Plumbing, Carpentry and joinery, Refrigeration and air-conditioning, Furniture , Auto body repairs and Catering.

Most programmes offered in these institutes in one way or other involve using tools and equipment that require high voltage to operate them. Some of the equipment produces temperature of over 800°C, hence, the slightest error is likely to lead to irreparable damage to both humans and property. In view of the rapid technologically and educational changes and the increasing importance of technical and vocational education for socio- economic development, the government recently considered it necessary to strengthen and enhance the capacity of workshops in public technical institutes including Asuansi and Cape Coast Technical. As a result, modern and heavy equipment have been installed for programmes in the following departments: mechanical, carpentry and joinery, block laying and concreting, electrical and auto mechanics departments. The equipment includes modern lathe machines, power saw,

industrial welding machines, industrial drilling machines, industrial hydraulic press and lift with some sensitive gadget that need special care.

The nature of the equipment is such that they put responsibility on both the teacher and student to ensure safety and absence of risk to health in connection with the use and handling of equipment. Safety is an attitude. For the student to develop the proper safety attitude to promote accident free environment he should be involved in the process and be aware and willing to follow laid down rules, which aim at ensuring safety. The student should become familiar with labels on equipment, safety data sheets, the definitions and descriptions on safety practices in the workshops.

The newly installed machines and equipment at the mechanical engineering workshops of Asuansi and Cape Coast Technical Institutes expose teachers and students to such risks as: lifting heavy weights, exposure to motor-driven cutting tools, repetitive strain. Other risk are exposure to hot cooking equipment, slippery floors, sharp objects, hot grease, volatile and highly flammable cleaning solutions, ultraviolet (UV) rays, red hot materials, and electrocution from high voltage, Further risk includes noise which has potential to damage eardrums. The nature of the equipment and activities in these schools put demand on instructors to be better informed on ways to avoid pitfalls as well as how to deal with accidents.

3.3 Research Design

This study employed descriptive method to gather the relevant data obtained from the research area. It was because of data, and the plan of analysis, the descriptive study seeks to gather information so that a description of what is going on can be made. This method may be designed to discover whether there is any relationship between two variables (Agyedu et al 2011). Therefore, it was used to describe the nature of the situation as it stood during the research period.

3.4 Population

The population of this survey constituted everything the researcher wants to study. In this regard, the population was made up of mechanical engineering students at both Asuansi Technical and Cape Coast Technical Institutes. The estimated number given by the school authorities put the figure at 100.

3.5 Sample

Because of the small number of the population it was necessary that the researcher engage the entire population in the study. This, the researcher believes will make the results more valid and reliable.

3.6 Sampling procedure

The mechanical departments were used in the study. Looking at the population of students in these departments of the schools, it became very necessary for the researcher to employ the entire population in the study. As a result of this situation, all the 100 students were engaged in the study.

3.7 Data

Clarke and Dawson (1999) have classified the research data into primary data and secondary data. The primary data are collected to satisfy the specific purpose of the study. Secondary data on the other hand are published findings from earlier research studies and may not pertain specifically to the current study. Secondary data are often collected at the beginning of research to provide back ground and basic information about the topic being researched (Anderson and Nylander, 1999)

3.7.1 Secondary Data Collection

Several forms of secondary data have been employed in this research. These include published safety articles of various forms concerning the subject. For instance, the researcher depended to a large extent on research conducted outside our immediate environment bordering on the subject. This helped the researcher gain a deeper understanding of the presented research problem. These secondary data were employed to a significant extent in the preparation and writing of the background. Quite a number the secondary data were used for the literature review and the drafting of the questionnaire.

It could be said that although a major part of the data came from the field, secondary data in the forms of policy document of Ghana Education service, the International Labour Organization, UNESCO, and many relevant documents regarding safety and TVET needed to be collected and analyzed. This information helped the researcher to understand the subject understudy better.

3.7.2 Primary Data

Primary data is the data which is collected by the researcher directly from his own observations and experiences. Primary data for this study were collected using questionnaires (Appendices A&B).

3.8 Data Collection of Instruments

The main instrument of data collection was the questionnaire. This study employs two different self-administered questionnaires. The merits of questionnaires have been enumerated by Mouly (1970) as including:

1. It permits wide coverage at minimum expense both in money and effort.
2. It affords wider geographic coverage and reaches persons who are difficult to contact.
3 It makes for greater validity of results through promoting the selection of a larger more representative sample.
4 Anonymity may elicit more candid and objective replies.
5 It allows for greater uniformity in the manner in which the questions are posed, ensuring greater comparability in the answers (cited in Lacey, 2000).

Because of the reasons enumerated above, and the nature of research being conducted the questionnaire was found very appropriate data collection instrument to enable the researcher collect the kind of information needed.

3.9 The Questionnaire

The questionnaire has been divided into two parts - Part One and Two. The entire questionnaire was made up of 60 questionnaire items, comprising 49 close ended questions and 12 opened ones. Part one of the questionnaires (test) which sought to elicit from the respondents their knowledge on the operations of general workshop machines as such the lathe, power hacksaw, milling, grinder, drilling etcetera, and also the respondents' degree of utilisation of the various safety precautions needed to operate these machines and equipment available to them in the school workshop. Part I was divided into sections, that is, from 'A' to 'H' and comprising the following:

Section 'A' sought to elicit from the respondents matters regarding the machine shop. This was answered in the form of a test supervised by the researcher and one tutor from the school. This section deals with General safety in the machine shop. It was made up of 11 test items. Section 'B' was also a test about the lathe machine, made up of 8 test

items which main purpose were to find out from the students their degree of understanding in the use of the lathe machine. Section 'C' dealt with knowledge about the power hacksaw. This section was made up of 7 test items. Section 'D' was a test on safety regarding the use of the milling machine. This was made up of 7 test items. Section 'E' dealt with safety test for the Grinder and was made up of 7 test items. Section 'F' was a test about drilling machines, comprising 8 test items. Section 'G' consisted of 13 test items seeking to know about the respondents' degree of utilisation of electricity and electronics safety in the school workshop.

All the sections in part one of the questionnaire were Multiple Choice Test. Also, except sections 'A', 'B', and 'G', all the sections were accompanied with well labelled diagrams of the machines on which the tests were about. The researcher would like to admit that a good number of the questionnaire items were adapted from the literature on that was gathered for purpose of review. Diagrams accompanying the tests were adapted from 'safety manual for schools' by the Louisiana State Department of Education, USA in 1982. Part II of the questionnaire which consisted of 12 open-ended questions, 6 of which dealt with adherence to safety while the other 6 endeavoured to elicit from the respondents their level of awareness on the utilisation of safety in the school workshop.

3.10 Data Collection Procedure

The researcher chose a day each during the internal examination period of the institute. The reason was that during examination period it was difficult for students to be absent and that either absenteeism is nonexistent or reduced to barest minimum. This enabled the researcher to have all respondents from the people he was interested in.

Part one of the questionnaires was given to the students first and they were made aware of the study and its importance. The tests were supervised by the researcher. The

approximate time for the completion of Part one of the questionnaires was 80 minutes. After respondents have completed Part one, the Part Two of the questionnaire was given to the students to complete and returned to the researcher. The researcher had a 100 per cent rate of response.

3.11 Methods of Data Analysis

The data obtained from the respondents was analysed using the Statistical Package for Social Sciences version (SPSS v 16). This was chosen for easy analysis and a better understanding of the study by interested parties.

CHAPTER FOUR

ANALYSIS OF DATA

4.1 Introduction

This chapter analyzed the result of the study based on the research question guiding the study.

4.2 Demographic Information of the Respondents

This chapter contains tables, frequency and percentages depicting the gender (table 4.1), age of the respondents (table 4.2) and year of study (table 4.3).

Table 4.1: Gender of Respondents

Gender of respondents	Frequency	Percent
Male	100	100.0
Total	100	100

Table 4.1 shows 100% of the respondents were males. The study indicates that more males patronise technical engineering programmes compared to females.

Table 4.2 indicates that 47% of the respondents were between the age ranges 18-20 years, 31% were below 18 years whiles 22% were 20 years and above.

Table 4.2: Age range of the Respondents

Age of Respondents	Frequency	Percent
below 18 years	31	31.0
18-20 years	47	47.0
20 years and above	22	22.0
Total	100	100.0

Table 4.3 shows that 45% of the respondents were in their first year of study, 28% were in the second year and 27% were in the third year.

Table 4.3: Respondents year of study

Year of study	Frequency	Percent
Year 1	45	45.0
Year 2	28	28.0
Year 3	27	27.0
Total	100	100.0

4.3 Student's knowledge about safety precautions in the institute mechanical workshop

This section contains Tables that show students' knowledge about safety precautions in the institute mechanical workshop. The general safety test for the machine shop is shown in Table 4.4.

Table 4.4: General safety test for the machine shop

General safety test for the machine shop	1 Freq. (%)	2 Freq. (%)	3 Freq. (%)	4 Freq. (%)	Total Freq. (%)
Eye protection should be worn when hammering.	1 (1%)		2 (2%)	97 (97%)	100 (100%)
Operate a machine at the shop anytime you want	68 (68%)	14 (14%)	11 (11%)	7 (7%)	100 (100%)
Gloves may be safely worn when handling hot objects	-	-	-	100 (100%)	100 (100%)

Table 4.4 shows that 97% of the respondents affirmed that it is important to wear eye protection when hammering, 2% of the respondents were neutral whiles 1% said that it is not important at all. The study shows that majority of the respondents affirmed that it is important to wear eye protection when hammering. The study results holds that 82% of the respondents affirmed that it is not important to operate a machine at the shop anytime you want, 11% were neutral whiles 7% of the respondents said that it is important. The study results shows that 100% of the respondents affirmed that it is important to wear gloves when handling hot objects. The concept of safety is an extensive concept that refers to the avoidance of any kind of accident leading to harm or injury to human beings (Pièrre-Cambacérès & Bouissou, 2013).

Table 4.5 indicates that 84% of the respondents said that it is not good to crack jokes at the mechanical workshops, because cracking jokes does not make people work faster whiles 16% said that it is good to crack jokes.

Table 4.5: periodically, cracking of jokes makes people work faster

ITEM	Frequency	Percent
True	16	16.0
False	84	84.0
Total	100	100.0

Table 4.6 shows that 97% of the respondents affirmed that it is good to clean workshops frequently to ensure safe working conditions whiles 3% said it is false. The study results affirmed that it is good to clean workshops frequently to ensure safe working conditions.

Table 4.6: Clean your workshop frequently to ensure safe working conditions.

Clean your workshop frequently to ensure safe working conditions.	Frequency	Percent
True	97	97.0
False	3	3.0
Total	100	100.0

Table 4.7 indicates that 94% of the respondents affirmed that machines must be stopped before greasing them whiles 6% said that it is false. The study results affirmed that machines must be stopped before greasing them.

Table 4.7: Machines must be stopped before greasing them

Machines must be stopped before greasing them	Frequency	Percent
True	94	94.0
False	6	6.0
Total	100	100.0

Table 4.8: Safety Test on the Lathe Machine

Safety Test on the Lathe Machine	1 Freq. (%)	2 Freq. (%)	3 Freq. (%)	4 Freq. (%)	Total Freq. (%)
Measurements should be made when the lathe is at dead stop.	-	2 (2%)	4 (4%)	94 (94%)	100 (100%)
Possibility of the chuck key from flying out of the lathe chuck, the key must be removed	-	4 (4%)	4 (4%)	92 (92%)	100 (100%)
Shifting gears and changing levers on the lathe should only be done when the machine is at dead stop.	66 (66%)	4 (4%)	6 (6%)	24 (24%)	100 (100%)
Before starting the lathe, you should see to it that it turns freely by rotating it by hand.	1 (1%)	1 (1%)	1 (1%)	97 (97%)	100 (100%)

The study results (Table 4.8) reveals that 94% of the respondents said that it is important to do Measurements when the lathe is at dead stop, 4% were neutral whiles 2% said that it is not important. Giovanis 2010 asserts that the development of standard management systems for occupational health and safety and their integration in the general administrative process of an organisation set additional requirements for measuring safety performance in an organization.

The study shows that 92% of the respondents affirmed that it is important to remove the key, because there is possibility of the chuck key from flying out of the lathe chuck, the key must be removed. 4% were neutral whiles 4% disagreed. The study revealed that 68% of the respondents said that it is not important to Shift gears and change levers on the lathe when the machine is at dead stop, 24% of the respondents affirmed that Shifting gears and changing levers on the lathe should only be done when the machine is at dead stop, whiles 6% were neutral. The study depicts that 97% of affirmed that before starting the lathe, it is important to see to it that it turns freely by rotating it by hand whiles 1% was neutral. This agrees with Stranks (2006), effective safety and health management is an integral part of all TVET institutional activities.

4.4 Utilisation of Health and Safety Guidelines

Table 4.9 shows the utilization of health and safety guidelines

Table 4.9: Safety Test on the Power Hacksaw

Safety Test on the Power Hacksaw	1 Freq. (%)	2 Freq. (%)	3 Freq. (%)	4 Freq. (%)	Total Freq. (%)
Before starting the saw, you should make sure that the blade will clear whole length of the work piece.	58 (58%)	38 (38%)	2 (2%)	2 (2%)	100 (100%)
Files should be used to remove sharp burrs and corners from any work to prevent your fingers from being cut.	97 (97%)	2 (2%)	1 (1%)	-	100 (100%)
When the saw is in motion, you should keep your hands away from the work.	13 (13%)	74 (74%)	4 (4%)	9 (9%)	100 (100%)
When operating a saw you should increase the cutting speed.	-	9 (9%)	15 (15%)	76 (76%)	100 (100%)

Table 4.9 indicates that 96% of the respondents agreed that before starting the saw, you should make sure that the blade will clear whole length of the work piece, 2% disagreed whiles 2% were neutral. Giovanis (2010) has observed that because of the various definitions that are given to the notion of safety, it is difficult to give a one-way definition to the safety measurement. In the effort to combine some of the above definitions, we accept that safety measurement deals with the quantity and quality of the activities that aim at the hazard reduction, as well as the quantity of the non-desirable events. The study results shows that 99% of the respondents agreed that files should be used to remove sharp burrs and corners from any work to prevent your fingers from being cut whiles 1% were neutral. The study results revealed that 87% of the respondents

agreed that when the saw is in motion, you should keep your hands away from the work, 9% disagreed whiles 4% were neutral. The study shows that 76% of the respondents disagreed that when operating a saw you should increase the cutting speed, 15% were neutral whiles 9% agreed. This agrees with Sulzer-Azaroff and Austin, (2000), the recording of safe and unsafe behaviour (behaviour sampling) in such a program, used for some time, may lead to change not only in behaviour but also in attitudes to safety, which indeed is the main advantage of this method.

Table 4.10: Safety Test on the Milling Machine

Safety Test on the Milling Machine	**1**	**2**	**3**	**4**	**Total**
	Freq. (%)	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**
Attachments and clamps on the milling machine should be checked for tightness before turning on the power.	69 (69%)	23 (23%)	3 (3%)	5 (5%)	100 (100%)
The best way to remove metal cuttings or chips from your work is to use a rag.		2 (2%)	2 (2%)	96 (96%)	100 (100%)
Striking a miller cutter with a steel hammer may damage the cutter	83 (83%)	12 (12%)	3 (3%)	2 (2%)	100 (100%)
The machine should be set for proper depth of cut	55 (55%)	45 (45%)	-	-	100 (100%)

Table 4.10 indicates that 92% of the respondents agreed that attachments and clamps on the milling machine should be checked for tightness before turning on the power, 5% disagreed whiles 3% were neutral. The study shows that 96% of the

respondents disagreed that the best way to remove metal cuttings or chips from your work is to use a rag, 2% agreed whiles 2% were neutral. The study shows that 95% of the respondents agreed that striking a miller cutter with a steel hammer may damage the cutter, 2% disagreed whiles 3% were neutral. The study results hold that 100% of the respondents agreed that the machine should be set for proper depth of cut. The study concluded that students are aware of the right methods of handling safety equipment at the mechanical workshops.

4.5 The level of Awareness of the safety equipment

Table 4.11 indicates the level of awareness of the use of safety equipment in the mechanical workshops.

Table 4.11: Safety test on the grinder

Safety test on the grinder	**1**	**2**	**3**	**4**	**Total**
	Freq. (%)	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**
You must wear goggles when grinding	-	-	1 (1%)	99 (99%)	100 (100%)
When grinding a small piece of work you should use hand vice	-	18 (18%)	10 (10%)	72 (72%)	100 (100%)
You should stand to one side of the grinding wheel while it is gathering speed		3 (3%)	3 (3%)	94 (94%)	100 (100%)
When using the grinder you should keep your hands away from the wheel	10 (10%)	5 (5%)	4 (4%)	81 (81%)	100 (100%)

Table 4.11 indicates that 99% of the respondents affirmed that it is important to wear googles when grinding whiles 1% were neutral. The study shows that 72% of the respondents affirmed that it is important to wear hand vice when grinding a small piece of work, 18% said that it is not important whiles 10% were neutral. The study revealed that 94% of the respondents agreed that it is important to stand to one side of the grinding wheel while it is gathering speed, 3% of the respondents were neutral and disagreed respectively. The study depicts that 81% of the respondents agreed that when using the grinder it is important to keep your hands away from the wheel, 15% of the respondents disagreed whiles 4% were neutral. Health and Safety (OHS) refers to the outcome of adequate protection of a worker from sickness, injury and disease arising from work (ILO, 2003).

Table 4.12: Safety Test on the Drilling Machine

Safety Test on the Drilling Machine	**1**	**2**	**3**	**4**	**Total**
	Freq. (%)	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**	**Freq. (%)**
Work should be held in vice or clamps when drilling.	59 (59%)	31 (31%)	4 (4%)	6 (6%)	100 (100%)
Centre punch where the hole is to be drilled.	-	-	-	100 (100%)	100 (100%)
Chuck should be stopped from revolving in completion of work by hand.	92 (92%)	5 (5%)	1 (1%)	2 (2%)	100 (100%)
Wearing of goggles when drilling to protect the eyes.	-	-	-	100 (100%)	100 (100%)

The results in Table 4.12 affirmed that 90% of the respondents said that Work should not be held in vice or clamps when drilling, 6% of the respondents agreed whiles 4% were neutral. The study finding hold that 100% of the respondents agreed it is important to Centre punch where the hole is to be drilled. The study shows that 97% of the respondents affirmed that it is not important to stop chuck from revolving in completion of work by hand, 2% said it is important whiles 1% were neutral. Moreover, 100% of the respondents agreed that it is important to wear goggles when drilling to protect the eyes. The *safety inspection* has been the main tool for maintaining safe conditions and monitoring unsafe practices from the time Heinrich formulated his theory on the causes of incidents and for many years thereafter (Petersen, 1998).

4.6 General safety Test for Electricity/Electronics

Table 4.13: General safety Test for Electricity/Electronics

General safety Test for Electricity/Electronics	1 Freq. (%)	2 Freq. (%)	3 Freq. (%)	4 Freq. (%)	Total Freq. (%)
Down wires lying on the ground should be reported to the police department.	-	-	3 (3%)	97 (97%)	100 (100%)
When fuse burns out you should first place a heavy wire in the fuse holder.	-	2 (2%)	3 (3%)	95 (95%)	100 (100%)
Wear protective clothing when working with acids and etchants.	77 (77%)	23 (23%)	-	-	100 (100%)
Steel ladders for working on electrical equipment are the best	75 (75%)	25 (25%)	-	-	100 (100%)

Table 4.13 depicts that 97% of the respondents disagreed that down wires lying on the ground should be reported to the police department whiles 3% were neutral. The study results revealed that 95% of the respondents disagreed that when fuse burns out you should first place a heavy wire in the fuse holder, 3% were neutral whiles 2% of the respondents agreed. The study shows that 100% of the respondents agreed that it is important to wear protective clothing when working with acids and etchants. The study revealed that 100% of the respondents agreed that Steel ladders for working on electrical equipment are the best. The study concluded that the respondents knows how to utilise electrical equipment to ensure safety at the electrical workshops. This improved safety at the workshops.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

This chapter discussed the results of the study according to the research objectives of the study. The literature review of the study was used to discuss the specific findings in this chapter.

5.2 Student's knowledge about safety precautions in the institute mechanical workshop.

5.2.1 General safety test for the machine shop

The study shows that 97% of the respondents affirmed that it is important to wear eye protection when hammering, 2% of the respondents were neutral whiles 1% said that it is not important at all. The study shows that majority of the respondents affirmed that it is important to wear eye protection when hammering. The study result holds that 82% of the respondents affirmed that it is not important to operate a machine at the shop anytime you want, 11% were neutral whiles 7% of the respondents said that it is important. The study results show that 100% of the respondents affirmed that it is important to wear gloves when handling hot objects. The concept of safety is an extensive concept that refers to the avoidance of any kind of accident leading to harm or injury to human beings (Piètre-Cambacérès & Bouissou, 2013).

5.2.2 Safety Test on the Lathe Machine

The study results revealed that 94% of the respondents said that it is important to do measurements when the lathe is at dead stop, 4% were neutral whiles 2% said that it is not important. Giovanis 2010 asserts that the development of standard management

systems for occupational health and safety and their integration in the general administrative process of an organisation set additional requirements for measuring safety performance in an organisation.

The study shows that 92% of the respondents affirmed that it is important to remove the key, because there is possibility of the chuck key from flying out of the lathe chuck, the key must be removed. 4% were neutral whiles 4% disagreed. The study revealed that 68% of the respondents said that it is not important to shift gears and change levers on the lathe when the machine is at dead stop, 24% of the respondents affirmed that shifting gears and changing levers on the lathe should only be done when the machine is at dead stop, whiles 6% were neutral. The study depicts that 97% of affirmed that before starting the lathe, it is important to see to it that it turns freely by rotating it by hand whiles 1% was neutral. This agrees with Stranks (2006), effective safety and health management is an integral part of all TVET institutional activities. If TVET is to reflect contemporary technological practice, methods of safety planning should reflect what happens in technological practice and the relevant regulations and standards that underlie safe practice in the different technological areas.

5.3 Utilisation of Health and Safety Guidelines

The study indicates that 96% of the respondents agreed that before starting the saw, you should make sure that the blade will clear whole length of the work piece, 2% disagreed whiles 2% were neutral. Giovanis (2010) has observed that because of the various definitions that are given to the notion of safety, it is difficult to give a one-way definition to the safety measurement. In the effort to combine some of the above definitions, we accept that safety measurement deals with the quantity and quality of the activities that aim at the hazard reduction, as well as the quantity of the non-desirable

events. The study results shows that 99% of the respondents agreed that files should be used to remove sharp burrs and corners from any work to prevent your fingers from being cut whiles 1% were neutral. The study results revealed that 87% of the respondents agreed that when the saw is in motion, you should keep your hands away from the work, 9% disagreed whiles 4% were neutral. The study shows that 76% of the respondents disagreed that when operating a saw you should increase the cutting speed, 15% were neutral whiles 9% agreed. This agrees with Sulzer-Azaroff and Austin, (2000), the recording of safe and unsafe behaviour (behaviour sampling) in such a program, used for some time, may lead to change not only in behaviour but also in attitudes to safety, which indeed is the main advantage of this method. However, the description of all critical safe and unsafe behaviours (as the method requires) and the training of staff and observers regarding their identification, requires time, money and expertise and this is the main deterrent in implementing such programs. Moreover, as a relatively new method, its relationship with the reduction of incidents and overall performance in safety matters are still under investigation.

5.3.1 Safety Test on the Milling Machine

The study indicates that 92% of the respondents agreed that attachments and clamps on the milling machine should be checked for tightness before turning on the power, 5% disagreed whiles 3% were neutral. The study shows that 96% of the respondents disagreed that the best way to remove metal cuttings or chips from your work is to use a rag, 2% agreed whiles 2% were neutral. The study shows that 95% of the respondents agreed that striking a miller cutter with a steel hammer may damage the cutter, 2% disagreed whiles 3% were neutral. The study results hold that 100% of the respondents agreed that the machine should be set for proper depth of cut. A joint

definition of occupational health endorsed by the ILO and WHO (as revised in 1995) states that: *"Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the workers in an occupational environment adapted to their physiological and psychological capabilities; and, to summarize : the adaptation of work to man and of each man to his job"* (WHO, 1995: 3).

5.4 The level of Awareness of the safety equipment

5.4.1 Safety test on the grinder

Table 4.11 indicates that 99% of the respondents affirmed that it is important to wear googles when grinding whiles 1% were neutral. The study shows that 72% of the respondents affirmed that it is important to wear hand vice when grinding a small piece of work, 18% said that it is not important whiles 10% were neutral. The study revealed that 94% of the respondents agreed that it is important to stand to one side of the grinding wheel while it is gathering speed, 3% of the respondents were neutral and disagreed respectively. The study depicts that 81% of the respondents agreed that when using the grinder it is important to keep your hands away from the wheel, 15% of the respondents disagreed whiles 4% were neutral. Health and Safety (OHS) refers to the outcome of adequate protection of a worker from sickness, injury and disease arising from work (ILO, 2003). The purpose of OHS is to provide safe working environment for all employees and workers in every organisation irrespective of size, sector or industry. The outcome of such practice and compliance with OHS guidelines at every workplace and

environment directly and indirectly impacts productivity as well as performance. Thinking beyond the benefits for both the organisation and the country, it is worthy of note that the providing a safe and healthy working environment for workers is a right which is tied to employees fundamental right of "right to live a healthy life". Effective implementation of OHS in organizations will thwart both fatal and non-fatal accidents as well as illnesses at the work place there ensuring the welfare of the entire workforce. According to the International Conference of Labour Statistics (1998), occupational accident could also be defined as an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death. Occupational injury according to the ILO, (2003), is defined as "death, any personal injury or disease resulting from an occupational accident" whiles occupational disease is defined as "a disease contracted as a result of an exposure to risk factors arising from work activity".

5.4.2 Safety Test on the Drilling Machine

The results of the study affirmed that 90% of the respondents said that work should not be held in vice or clamps when drilling, 6% of the respondents agreed whiles 4% were neutral. The study finding hold that 100% of the respondents agreed it is important to centre punch where the hole is to be drilled. The study shows that 97% of the respondents affirmed that it is not important to stop chuck from revolving in completion of work by hand, 2% said it is important whiles 1% were neutral. Moreover, 100% of the respondents agreed that it is important to wear goggles when drilling to protect the eyes. The *safety inspection* has been the main tool for maintaining safe conditions and monitoring unsafe practices from the time Heinrich formulated his theory on the causes of incidents and for many years thereafter (Petersen, 1998). The

introduction of safety management systems created the requirement forth *safety audit,* which is a detailed examination and evaluation of all components of the system to ensure that they comply with prescribed standards. Safety audits may include: safety inspections, inspection of documents and interviews. In both methods, quantitative results can be used as indicators of an organization's safety and are both a measure of long-term monitoring and a way of evaluating staff attitudes on safety issues. However, both methods regard the organisation as a closed system, which, in the case of the safety inspection has the characteristics of a Taylor organisational approach, or, in the case of safety audits, adopts a socio-technical approach (Van de Kerckhove, 1998).

5.4.3 General safety Test for Electricity/Electronics

The study depicts that 97% of the respondents disagreed that down wires lying on the ground should be reported to the police department whiles 3% were neutral. The study results revealed that 95% of the respondents disagreed that when fuse burns out you should first place a heavy wire in the fuse holder, 3% were neutral whiles 2% of the respondents agreed. The study shows that 100% of the respondents agreed that it is important to wear protective clothing when working with acids and etchants. The study revealed that 100% of the respondents agreed that steel ladders for working on electrical equipment are the best. According to Giovanis (2010) the measurement and evaluation of an organisation's performance on health and safety conditions at work (H&S) mainly aims at the provision of information about the current situation and the progress of the strategies, processes and activities that are adopted by an organisation with the view to keep H&S hazards under control.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter deals with the summary, conclusion and recommendation. The chapter also contains suggestions for further research.

6.2 Summary

The general objective of this study was to investigate the utilisation of health and safety measures among students of Asuansi and Cape Coast Technical Institutes. This study employed descriptive method to gather the relevant data obtained from the research area. The study used quantitative research approach for the study. The population for the study was 100. The population was made up of mechanical engineering students in Asuansi Technical and Cape Coast Technical Institutes. Purposive sampling technique was used to select 100 participants for the study. Primary and secondary data were used for the study. Primary data for this study were collected using questionnaires. The instruments were administered by the researcher in person. The data obtained from the respondents was analysed using the Statistical Package for Social Sciences version (SPSS v 16). This was chosen for easy analysis and a better understanding of the study by interested parties.

6.3 Key Findings of the Study

6.3.1 Student's knowledge about safety precautions in the institute mechanical workshop.

6.3.2 General safety test for the machine shop

The study shows that majority (97%) of the respondents affirmed that it is important to wear eye protection when hammering. Moreover, 82% of the respondents affirmed that it is not important to operate a machine at the shop anytime you want. The study results shows that 100% of the respondents affirmed that it is important to wear gloves when handling hot objects. The study indicates that 84% of the respondents said that it is not good to crack jokes at the mechanical workshops, because cracking jokes does not make people work faster. Furthermore, 97% of the respondents affirmed that it is good to clean workshops frequently to ensure safe working conditions. The study indicates that 94% of the respondents affirmed that machines must be stopped before greasing them.

6.3.3 Safety Test on the Lathe Machine

The study results revealed that 94% of the respondents said that it is important to do measurements when the lathe is at dead stop. The study shows that 92% of the respondents affirmed that it is important to remove the key, because there is possibility of the chuck key flying out of the lathe chuck. To add more, 68% of the respondents said that it is not important to shift gears and change levers on the lathe when the machine is at dead stop. The study depicts that 97% of affirmed that before starting the lathe, it is important to see to it that it turns freely by rotating it by hand.

6.4 Utilisation of Health and Safety Guidelines

6.4.1 Safety Test on the Power Hacksaw

The study indicates that 96% of the respondents agreed that before starting the saw, you should make sure that the blade will clear whole length of the work piece. The study results show that 99% of the respondents agreed that files should be used to remove sharp burrs and corners from any work to prevent fingers from being cut. Moreover, 87% of the respondents agreed that when the saw is in motion, you should keep your hands away from the work. The study shows that 76% of the respondents disagreed that when operating a saw you should increase the cutting speed. The study indicates that 96% of the respondents agreed that before starting the saw, you should make sure that the blade will clear whole length of the work piece.

6.4.2 Safety Test on the Milling Machine

The study indicates that 92% of the respondents agreed that attachments and clamps on the milling machine should be checked for tightness before turning on the power. The study shows that 96% of the respondents disagreed that the best way to remove metal cuttings or chips from your work is to use a rag. Moreover, 95% of the respondents agreed that striking a miller cutter with a steel hammer may damage the cutter. The study results hold that 100% of the respondents agreed that the machine should be set for proper depth of cut.

6.5 The level of Awareness of the safety equipment

6.5.1 Safety test on the grinder

The study indicates that 99% of the respondents affirmed that it is important to wear googles when grinding whiles 1% were neutral. Furthermore, 72% of the

respondents affirmed that it is important to wear hand vice when grinding a small piece of work. The study revealed that 94% of the respondents agreed that it is important to stand to one side of the grinding wheel while it is gathering speed. The study depicts that 81% of the respondents agreed that when using the grinder it is important to keep your hands away from the wheel.

6.5.2 Safety Test on the Drilling Machine

The results of the study affirmed that 90% of the respondents said that work should not be held in vice or clamps when drilling. The study finding hold that 100% of the respondents agreed it is important to centre punch where the hole is to be drilled. The study shows that 97% of the respondents affirmed that it is not important to stop chuck from revolving in completion of work by hand. Moreover, 100% of the respondents agreed that it is important to wear goggles when drilling to protect the eyes.

6.5.3 General safety Test for Electricity/Electronics

The study depicts that 97% of the respondents disagreed that down wires lying on the ground should be reported to the police department. The study results revealed that 95% of the respondents disagreed that when fuse burns out you should first place a heavy wire in the fuse holder. Moreover, 100% of the respondents agreed that it is important to wear protective clothing when working with acids and etchants. The study revealed that 100% of the respondents agreed that Steel ladders for working on electrical equipment are the best

6.6 Conclusions

The study concluded that it is important to wear eye protection when hammering in the workshop. Moreover, students are aware that it is not important to operate a machine at the shop anytime they want. Also, it is important to wear gloves when handling hot objects. Furthermore, it is not good to crack jokes at the mechanical workshops, because cracking jokes does not make people work faster. The study also concluded that, it is good to clean workshops frequently to ensure safe working conditions and machines must be stopped before greasing them. The students also noted that it is important to do measurements when the lathe is at dead stop, it is important to remove the key, because there is possibility of the chuck key flying out of the lathe chuck. It is not important to shift gears and change levers on the lathe when the machine is at dead stop, before starting the lathe, it is important to see to it that it turns freely by rotating it by hand and before starting the saw, students should make sure that the blade will clear whole length of the work piece. To add more, students are aware that, attachments and clamps on the milling machine should be checked for tightness before turning on the power, the best way to remove metal cuttings or chips from your work is to use a rag, striking a miller cutter with a steel hammer may damage the cutter and the machine should be set for proper depth of cut. The students revealed that, it is important to wear googles when grinding, it is important to wear hand vice when grinding a small piece of work, it is important to stand to one side of the grinding wheel while it is gathering speed and when using the grinder it is important to keep your hands away from the wheel.

6.7 Recommendations

According to the key findings and conclusion of the study, the researcher recommended that;

1. The Ghana education service, through the district education directorate should organize periodic demonstration workshops and seminars to educate technical students regarding the safe use of tools and instruments to improve safety at the mechanical workshops.
2. There is the need to provide adequate teaching and learning materials to improve technical student's practical expertise in the mechanical shops.
3. Technical students should be allowed to independently use TLMs to improve their practical skills.
4. The Ghana education service, through the district education directorate should organize intensive in-service training to technical teachers to equip them with the necessary skills needed to enhance their practical teaching experience.

6.8 Suggestions for Further Research

Based on the recommendations of the study, the study suggested that a similar research should be undertaken to assess the impact of providing adequate TLMs on technical teachers' practical teaching experience.

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APPENDIX

UNIVERSITY OF EDUCATION, WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION

DEPARTMENT OF MECHANICAL TECHNOLOGY

Appendix 1: Questionnaire for Technical Students

The researcher is a Master of Technology Education in Mechanical Technology Student at the University of Education, Winneba, Kumasi Campus. This project is undertaken solely for academic use and it is being conducted to find out the utilisation of safety practices by students of Technical Institutes in Ghana. Your responses to the following questions will help in making this study a success. Please do not write your name, and do remain anonymous.

SECTION A: PERSONAL DATA

Sex..... Male [ ] Female [ ]

Age.....

Course..... .

Year.....

SECTION B: Find out whether students of Asuansi and Cape Coast Technical have any knowledge about safety precautions in the institute mechanical workshop.

GENERAL SAFETY TEST FOR THE MACHINE SHOP

Statement	Not important at all	Not important	Neither important nor unimportant	Important
1. Eye protection should be worn when hammering.				
2. Operate a machine at the shop anytime you want.				
3. Metal chips should be cleaned form machines by compressed air.				
4. Gloves may be safely worn when handling not objects				

If you believe the statement is true, circle 'T' if you believe it is false circle 'F'

1. Occasionally a practice joke is good for the moral and keeps people "on their toes" T / F
2. Clean your work station frequently to ensure safe working conditions. T / F
3. Machines must be stopped before oiling them. T / F
4. Metal cutting tools should be kept dull so they won't cut the inexperienced machinist. T /F

SAFETY TEST ON THE LATHE MACHINE

Statement	Not important at all	Not important	Neither important nor unimportant	Important
1. Measurements should be made when the lathe is at dead stop.				
2. Possibility of the chuck key from flying out of the lathe chuck the key must be removed.				
3. Shifting gears and changing levers on the lathe should only be done when the machine is at dead stop.				
4. Before starting the lathe, you should see that it turns freely by rotating it by hand.				

SECTION D: Examine the extent to which students of Asuansi and Cape Coast Technical institutes utilize health and safety guidelines in the institute's mechanical workshop.

SAFETY TEST ON THE POWER HACKSAW

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree
1. Before starting the saw, you should make sure that the blade will clear whole length of the work piece.				
2. Files should be used to remove sharp burrs and corners from any work to prevent your fingers from being cut.				
3. When the saw is in motion, you should keep your hands away from the work.				
4. When operating a saw you should increase the cutting speed.				

SAFETY TEST ON MILLING MACHINE

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree
1. Attachments and clamps on the milling machine should be checked for tightness before turning on the power.				
2. The best way to remove metal cuttings or chips from your work is to use a rag.				
3.Striking a miller cutter with a steel hammer may damage the cutter				
4. The machine should be set for proper depth of cut.				

SECTION D: Determine the level of awareness of the safety equipment available in the school workshop of the Institute.

SAFETY TEST ON THE GRINDER

Statement	Not important at all	Not important	Neither important nor unimportant	Important
1. You must wear goggles when grinding because				
2. To grind a small pieces of work you should				
3. You should stand to one side of the grinding wheel while it is gathering speed because				
4. When using the grinder you should keep your hands away from the				

SAFETY TEST ON THE DRILLING MACHING

Statement	Not important at all	Not important	Neither important nor unimportant	Important
1. Work should be held in vice or clamps when drilling.				
2. Centre punch where the hole is to be drilled.				
3. Chuck should be stopped form revolving in completion of work by hand.				
4. Wearing of goggles when drilling to protect the eyes.				

GENERAL SAFETY TEST FOR ELECTRICITY/ELECTRONICS

Statement	Strongly agree	Agree	Neither agree nor disagree	Disagree
1. Down wires lying on the ground should be reported to the police department.				
2. When fuse burns out you should first place a heavy wire in the fuse holder.				
3. Wear protective clothing when working with acids and etchants.				
4. Steel ladders for working on electrical equipment are the best.				

Thank you