UNIVERSITY OF EDUCATION WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION – KUMASI

AN ASSESSMENT OF COMPETENCIES OF STUDENTS PERFORMANCE IN CONVENTIONAL LATHE MACHINING AT THE HIGHER NATIONAL DIPLOMA (HND) LEVEL A CASE STUDY OF KOFORIDUA AND ACCRA POLYTECHNICS

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AUGUST, 2013

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DEPARTMENT OF MECHNICAL TECHNOLOGY

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AUGUST, 2013

DECLARATION

STUDENT'S DECLARATION

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

Signature ……

Date: ……..

SUPERVISOR'S DECLARATION

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

NAME: MR. STEPHEN K. AMOAKOHENE

Signature ……

Date: ……

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DEDICATION

This Dissertation is dedicated to the AGUTEY-MENSAH Family at Tema-Afienya Mataheko. God richly bless you.

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ABSTRACT

The rationale for this write up generally enlighten the students and especially the practical lecturers and instructors to have a broader perspective about ascertaining the competencies of students performance level of conventional lathe machine usage in the Polytechnics, the various competencies and strategies adopted in teaching the practical skills and to discover the reasons for the low performance of Higher National Diploma (HND) graduate in the industries on the use of conventional lathe machine.

The case study was conducted in two Polytechnics to be precise Koforidua Polytechnic in the Eastern Region, and Accra Polytechnic in the Greater Accra Region. The researcher investigated into the background of practical skills, students‟ competencies, and the concern of instructors or practical lecturers.

However, through questionnaires, interviews and observations, the researcher had found out that, most Polytechnics were not adequately equipped with conventional lathe machines, tools and equipment. They could not achieve standard level of student performance in Lathe machining. Also, practical lecturers have different teaching strategies and large number of student to a machine during practical lessons with inadequate practical lecturers, and less practical periods and hours.

Meanwhile, institutions must train instructors and have general, standard competencies and strategies for teaching practical lesson as well as provision of adequate and suitable materials for practical training and to check students‟ attitude towards practical lesson.

CHAPTER ONE: INTRODUCTION

1.0 Background to the Study

The Lathe machine is the father of all machines and is recorded in the early History of many races. According to Prichard (1970), when equipped with a fixed tool rest, it was used for wood turning.

Strategies consisting of a method or plan chosen to bring about a desired future, such as achievement of a goal or solution to a problem stands to be lacking in the use of the conventional Lathe machine. The art and science of planning and marshalling resources for their most efficient and effective use of the conventional lathe is critically examined to improve profitability in teaching field and production.

Competency is the ability of an individual to do a job properly has a greater part to play in the use of these conventional lathes. Furthermore, competency which can also be defined as a set of defined behaviours that provide a structured guide enabling the identification, evaluation and development of the behaviours in individual employees cannot be demeaned.

Other school of thought see "competency" as a combination of knowledge, skills and behaviour used to improve performance; or as the state or quality of being adequately or well qualified, having the ability to perform a specific role. For instance, management competency might include systems thinking and emotional intelligence, and skills in influence and negotiation. Competency has different meanings, and continues to remain one of the most diffuse terms in the management development sector, and the organizational and occupational literature.

An assessment of Competencies of student performance in Conventional Lathe machining at the Higher National Diploma Level" is the topic for this research work and much comprehensive work is done to go into details to address the foreign standard of middle level manpower which is the best skills for enhancing productivity in the industrial world.

1.1 Statement of the Problem

The quality of competencies of the conventional lathe machining at the Polytechnic level when examined is not effective enough for the acquisition of the skills needed to transform the individual for the technological industrialization world.

Another area of concern is the time spent in teaching these practical lessons at this level of the educational institutions. The actual competency training to equip students with ability, aptitude and perfect skills has fallen below standard. Are students given enough time to practice? How much time is given for each student to operate or practice during instructional period and at his or her own time?

Last but not the least, developing interest to learn conventional lathe machining skills would involve establishing proper planning which would cause the individual to enter into those activities described as learning. This is followed by the strategy being structured so that the learner can grasp the information provided readily, of which the strategy should be sequenced in most effective manner then the strategy designed with consequence of proper perspective of reward and punishments. These basic steps are omitted in the instructional manual to deliver all important practical oriented conventional lathe machining in the Polytechnics.

1.2 Significance of the Study

When proper and accurate teaching strategies are adopted to teaching of conventional lathe machining, the teacher or the giver of knowledge as well as the learner or the receiver of the new ideas come to an equal level of understanding which in turn brings high competency skills and great benefit to the individual, industry and the society at large, making it a knowledge base for both the learner and the teacher.

According to Singh et al (2004); predisposition, structure, sequence and ultimately the consequence of a teaching strategy should energize the leaner to solve complex problems which is intrinsically rewarding which forms a significant base for this research study.

The researcher sees this research as very important to create awareness of the rewarding nature the worth adopting strategies and making competencies a master card in the teaching process on the conventional lathe for a new perspective in a new millennium.

1.3 Objectives

The objectives of the study are to:

1. ascertain the level of conventional lathe usage in the Polytechnics
2. ascertain the various competencies employed in teaching convectional lathe lessons
3. ascertain the strategies adopted for teaching these competencies on the convectional lathe
4. ascertain the reasons for the low performance of H. N. D graduate in the industries on the use of convectional lathe.
5. recommendappropriate ways to enhance H. N. D graduate performance on the use of the convectional lathe for the industry.

1.4 Research Questions

This Dissertation will seek to answer the following questions;

1. Are the Polytechnics equipped with Conventional Lathe Machines?
2. What competencies are needed for Polytechnic Students on the Conventional Lathe?
3. What is the level and standard of HND Students performance on Conventional Lathe?
4. What Strategies are used in teaching Competencies on the Conventional Lathe?

1.5 Limitations

Lack of capital and time confined the researcher to work in Engineering Departments of the selected Polytechnic of which it is strongly believed that expanding the scope of the research would have been very best. These limits also affected the number of questionnaires expected to be administered.

1.6 Definition of Terms

Strategies: Plan, scheme, policy, approach, and tactic – Is planning in any field being a carefully devised plan of action to achieve a goal or the act of developing or carrying out a devised plan of action to achieve a goal or the act of developing or carrying out a particular plan for gaining success in a particular activity (Encarta English Dictionary).

Competency:- Is a cluster of related knowledge, skills and attitude that affect a major part of one‟s job (a roll or a responsibility) that correlate with performance on the fact that can be measured against well-accepted standard and

that can be improved via training and development (Training Magazine: July, 1996).

Instructor: - Is defined as the one who arrange information and environment which constitutes a set of events that affect learners cognitive in such a way that learning is facilitated. (Frederick KwakuSarfo 2002).

Learner: - Is one who acquires knowledge, skills and attitudes through a learning process as well as the actual change in behavior in order to function successfully in a society. However, learning is the process that leads to relatively permanently change in behavior due to practice or experience. Moreover, Russel et al (1996) defined learning as the development of new knowledge, skills and attitudes as individuals interact with the information and the environment.

*Structur*e: - Is an arrangement or organization of something built or erected or other object that has been put together from many parts into a whole. Also, a system of parts or ways that parts link, function or made up of interrelated parts functioning as a whole or the fact of being linked together. (Longman Dictionary of English Language and Culture).

Sequence: - Series, succession, progression, chain, string cycle, order, arrangement classification, categorization - is defines as a group or number in which things are arranged, actions are carried out or evens happening in a specific order or having a specific connection following one another in time that is chronological sequence. (Longman Dictionary of English Language and Culture).

Teaching: - Teaching is also known as *instructional methods* and therefore be defined as procedure or asset of techniques selected by the instructor to help learners achieve the objective of the lesson. (Frederick KwakuSarfo 2002).

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

The researcher discussed the literature under the following areas,

- ❖ Historical setting of the lathe
- ❖ The conventional lathe machine
- ❖ Competencies on the conventional lathe machine
- ❖ Teaching strategies and feedback at the Higher National Diploma level
- ❖ Strategies for teaching competency on the conventional lathe machine
- ❖ Performance level of students on the lathe machine
- ❖ Assessing competencies on the conventional lathe

2.1 Historical Setting of the Lathe Machine

The lathe is an ancient tool, dating at least to ancient Egypt and known and used in Assyria and ancient Greece. The origin of turning dates to around (1300 BC) when the Ancient Egyptians first developed a two-person lathe. One person would turn the wood work piece with a rope while the other used a sharp tool to cut shapes in the wood. Ancient Rome improved the Egyptian design with the addition of a turning bow. (Chapman W.A.J. 1968).

According to Prichard (1970), in the middle Ages a pedal replaced hand-operated turning, freeing both the craftsman's hands to hold the woodturning tools. The pedal was usually connected to a pole, often a straight-grained sapling. The system today is called the "spring pole" lathe. Spring pole lathes were in common use into the early 20th century.

During the Industrial Revolution, mechanized power generated by water wheels or steam engines was transmitted to the lathe via line shafting, allowing faster and easier running and operating of the Lathe machine respectively. .

Metalworking lathes evolved into heavier machines with thicker, more rigid parts. Between the late 19th and mid-20th centuries, individual electric motors at each lathe replaced line shafting as the power source. Beginning in the 1950s, servomechanism was applied to the control of lathes and other machine tools via numerical control, which often was coupled with computers to yield computerized numerical control. Today manually controlled and CNC lathes coexist in the manufacturing industries. (Heinrich Arnold 2001).

The lathe machine is a machine tool which rotates the work piece on its axis to perform various operations such as cutting, sanding, knurling, drilling, or deformation, facing, turning, with tools that are applied to the work piece to create an object which has symmetry about an axis of rotation.(Bruice J Black 2007).

Lathes are used in woodturning, metalworking, metal spinning, Thermal spraying or parts reclamation, and glass-working. Lathes can be used to shape pottery, the best-known design being the potter's wheel. Most suitably equipped metalworking lathes can also be used to produce most solids of revolution, plane surfaces and screw threads or helices. Ornamental lathes can produce three-dimensional solids of incredible complexity.

The material can be held in place by either one or two *centres,* at least one of which can be moved horizontally to accommodate varying material lengths. (Green, J.N. 1972).

Other work-holding methods include clamping the work about the axis of rotation using a chuck or cullet, or to a faceplate, using clamps or dogs. Prichard (1970), gives examples of objects that can be produced on a lathe include candlestick holders, gun barrels, cue sticks, table legs, bowls, baseball bats, musical instruments (especially woodwind instruments), crankshafts, and camshafts.

2.1.1 Sizes and Capacity

The size and capacity an engine lathe is determined by the largest piece of stock that can be machined. „Lathe size is designated by the largest work diameter that can be swung over the bed or ways and generally the maximum distance between lathe centres“ (Krar et al 2005)

2.1.2 Precision

Precision tool room lathes are also known as standard manufacturing lathes and are used for all lathe operations, such as turning, boring, drilling, reaming, producing screw threads, taper turning, knurling, and radius forming, and can be adapted for special milling operations with the appropriate fixture. (Boothroyd and Knight 2006)

2.1.3 Varieties

The smallest lathes are "jewelers“ lathes" or "watchmaker lathes", which are small enough that they may be held in one hand. The workpieces machined on a jeweler's lathe are metal. Jeweler's lathes can be used with hand-held "graver"

tools or with compound rests that attach to the lathe bed. The term W/W refers to the Webster/Whitcomb collet and lathe, invented by the American Watch Tool Company [AWTC](1909), of Waltham, Massachusetts.

According to AWTC (1909), even larger lathes offering similar features for producing or modifying individual parts are called "engine lathes". Lathes of these types do not have additional integral features for repetitive production, but rather are used for individual part production or modification as the primary role.

Lathes of this size that are designed for mass manufacture, but not offering the versatile screw-cutting capabilities of the engine or bench lathe, are referred to as "second operation" lathes with a very large spindle bore and a chuck on both ends of the spindle are called "oil field lathes". Fully automatic mechanical lathes, employing cams and gear trains for controlled movement, are called screw machines. Lathes that are controlled by a computer are Computer Numeric Control (CNC) lathes, (Heinrich Arnold 2001p.11).

A lathe equipped with indexing plates, profile cutters, spiral or helical guides and others, so as to enable ornamental turning is an ornamental lathe. Various combinations are possible: for example, a vertical lathe have CNC as well such as a CNC VTL. International Standard Organization [ISO] (1968).

Major categories of Lathe Machine

- A Modern Woodworking Lathe
- Meta Working Lathes
- Metal Spinning Lathes
- Ornamental Turning Lathes
- Rotary Lathes
- Watchmaker's Lathe

2.1.4 Care And Maintenance of Lathes

According to [ISO](1968), Lathes are highly accurate machine tools designed to operate around the clock if properly operated and maintained. Lathes must be lubricated and checked for adjustment before operation. Improper lubrication or loose nuts and bolts can cause excessive wear and dangerous operating conditions.

2.1.5 Safety

All lathe operators must be constantly aware of the safety hazards that are associated with using the lathe and must know all safety precautions to avoid accidents and injuries. Krah et al. (2005 p.351) Carelessness and ignorance are two great menaces to personal safety. Other hazards can be mechanically related to working with the lathe, such as proper machine maintenance and setup.

2.2 The Conventional Lathe Machine

The Conventional lathe is a machine tool used principally for shaping pieces of metal (and sometimes wood or other materials) by causing the workpieceto be held and rotated by the lathe while a tool bit is advanced into the work causing the cutting action, (Repp & McCarthy,1989). The basic lathe that was designed to cut cylindrical metal stock has been developed further to produce screw threads, tapered work, drilled holes, knurled surfaces, and crankshafts. Modern lathes offer a variety of rotating speeds and a means to manually and automatically move the cutting tool into the workpiece. Machinists and maintenance shop personnel must be thoroughly familiar with the lathe and its operations to accomplish the repair and fabrication of needed parts. (Prichard 1970).

2.2.1 Types of Lathes

Lathes can be divided into three types for easy identification: engine lathe, turret lathe, and special purpose lathes. Some smaller ones are bench mounted and semi-portable, and the larger lathes are floor mounted and the engine lathe is ideally suited for this purpose.

Gap or Extension-Type Lathes:

Gap or extension-type lathes are similar to tool room lathes except that gap lathes can be adjusted to machine larger diameter and longer work pieces The swing can be increase by moving the bed a distance from the headstock, which is usually one or two feet.

2.2.2 General Lathe Operations

Lathe Speeds, Feeds, And Depth of Cuts*:* General operations on the lathe include straight andshoulder turning, facing, grooving, and parting, turning tapers, and cutting various screw threads. Before these operations can be done, a thorough knowledge of the variable factors of lathe speeds, feeds, and depth of cut must be understood. According to Krah et al. (2005), these factors differ for each lathe operation, and failure to use these factors properly will result in machine failure or work damage. The kind of material being worked, the type of tool bit, the diameter and length of the work piece, the type of cut desired (roughing or finishing), and the working condition of the lathe will determine which speed, feed, or depth of cut is best for any particular operation.

The guidelines which follow for selecting speed, feed, and depth of cut are general in nature and may need to be changed as conditions dictate. (WALSH, 2000).

Cutting Speeds

The cutting speed of a tool bit is defined as the number of feet of workpiece surface, measured at the circumference that passes the tool bit in one minute. Boothroyd*et al* (2006), said the cutting speed, expressed in millimeters per minute (MPM), must not be confused with the spindle speed of the lathe which is expressed in revolution per minute in (RPM). To obtain uniform cutting speed, the lathe spindle must be turned faster for workpieces of small diameter and slower for workpieces of large diameter.

Feed and Depth of Cut

Feed is the term applied to the distance the tool bit advances along the work for each revolution of the lathe spindle, (Prichard 1970). Feed is measured in inches or millimeters per revolution, depending on the lathe used and the operator's system of measurement.Depth of cut is the distance that the tool bit moves into the work, usually measured in thousandths of an inch or in millimetres.

Selection of Lathe Tools Shapes

Most of the lathe tools shapes and their marching operations are depicted in Appendix III, according to ([EITB] 1987 p.18)

Other lathe operations are:

- Facing
- Straight turning
- Shoulders turning
- Corners turning
- Grooves turning
- Taper turning
- Screw thread cutting
- Knurling on the lathe
- Drilling and boring with the lathe
- Hand tapping, hand diesing and threading on the lathe
- Reaming on the lathe

2.3 Competency on Conventional Lathe Machines

Competence is the ability of an individual to do a job properly. A competency is a set of defined behaviours that provide a structured guide enabling the identification, evaluation and development of the behaviours in individual employees, as defined, by (Craig C. Lundberg, 1970). Titled "Planning the Executive Development Program".

All competencies that can be developed include all domains belonging to learners, namely knowledge, skills, and work attitudes, while learners' potentials include feeling, sight, thought and action. Therefore, Technical education is directly related to the way of empowering all potentials belonging to learners in order that they possess certain competency. Competency is also used as a more

general description of the requirements of human beings in organizations and communities.

Competency has different meanings, and continues to remain one of the most diffuse terms in the management development sector, and the organizational and occupational literature. Substantially, Garavan & McGuire (2001) explain, that competency can be viewed from the two aspects, namely individual‟s attributes and learning outcomes. Competencies are the measurable or observable knowledge, skills, abilities, and behaviours (KSABs) critical to successful job performance. Choosing the right competencies allows employers to:

a. Plan how they will organize and develop their workforce.
b. Determine which job classes best fit their business needs.
c. Recruit and select the best employees.
d. Manage and train employees effectively.
e. Develop staff to fill future vacancies.

2.3.1 Using Competencies

Hoffman (1999) states that a complex job can employ the concept of competency as an individual‟s attributes, while a simple job can use the concept of competency as learning outcomes. However, the following are ways competency can be used.

In Training and Development

Done well, competencies allow supervisors to choose and prioritize training courses and other learning opportunities for employees. Training courses often describe the competencies students should be able to demonstrate by the end

of the class. Likewise, most on-the-job and other developmental assignments are designed to build certain knowledge and skills. Knowing how class content and developmental activities build mastery helps supervisors to

'Map' each position to a specific training and development plan that fosters growth in required competencies.

From the latter, competency is defined as the extent to which one‟s performance has satisfied the necessary standard and explains that it consists of knowledge of method, process, and technique designed to accomplish particular tasks and abilities to use tools and equipment (Nordhaug,1998).

In Career and Workforce Planning:

Competencies play a key role in workforce planning efforts. Hemispheric Project (2006), knowing which competencies the future workforce must possess to achieve business goals and deliverables helps organizations plan and design: Organizational structure, Recruitment strategies, Training budgets and development plans, and Job assignments and individual performance plans.

According to Harris, et al (1995), competency in the educational perspective is measured in terms of three separate aspects, namely knowledge, skill, and work attitude and it refers to specific and technical competency.

Employees can also use competencies to plan a career path. Knowing which competencies are critical for certain promotions allows employees to request training and development opportunities and seek out specific feedback and coaching.

Wood et al, (2000)state that, there are two types of competency, namely the generic competency and the specific or technical competency. Critically,

knowledge, skills, abilities, and behaviours (KSABs), are the types of Competency:

a. knowledge Competencies - practical or theoretical understanding of subjects.
b. skill and Ability Competencies - natural or learned capacities to perform acts.
c. behavioural Competencies - patterns of action or conduct

2.3.2 Knowledge Competencies

According to Boyett & Boyett (1998), knowledge as understanding of how something works and skill as an ability to apply knowledge to put something into reality. Knowledge refers to the practical or theoretical understanding of a subject. Knowledge requirements can be described in terms of mastery levels.

The descriptions below outline mastery levels for the following job types:

a. Professional Positions
b. Clerical and Administrative Positions
c. Managerial Positions

2.3.3Skill and Ability Competencies

Personality and ability can influence one‟s skill. The names and descriptions of skills and abilities vary among skilled craft, clerical, paraprofessional, professional, administrative, and technical jobs. Likewise, entry, journey, and senior positions often require the same skills, but performed at different levels of mastery. Most mastery requirements of Skill and Ability Competencies fall into one of three categories:

Entry-level: Works under direct or general supervision. Uses skills and abilities to complete routine tasks at the beginning, growing toward tasks of increasing complexity.

Journey-level: Works independently with only general direction and minimal supervision. Uses skills and abilities to complete complex tasks, including deciding which processes to use.

Senior-level: Works independently with only administrative direction. Uses skills and abilities to complete highly complex tasks, including developing new processes and working with high profile customers and stakeholders.

2.3.4 Behavioural Competencies

Behaviour refers to a pattern of actions or conduct and is rarely broken down into mastery levels. Instead, they are typically evaluated in terms of consistent adherence to a set of behavioural standards. Lists of three to five behavioural standards are common. Knowledge refers to one‟s thought of and belief in an attitudinal object, emotion to feeling of an attitudinal object, and behaviour to desire to act. A combination of knowledge and emotion can determine one‟s affective level. (Feldman,1993).

The affective domain according to Bloom‟s taxonomy Woolfolk & Nicholich, (1984) has five objectives. They include receiving, responding, valuing, Organizing, and characterizing. The process in which someone responds to an attitudinal object starting from receiving, responding, valuing, organizing, to Characterizing reflects a careful choice of action.

On the basis of a study on the concept of competency comprising knowledge, skill, and attitude, it can be concluded that competency in machinery

practice consists of knowledge of the principle of operating a machine tool, knowledge of the procedure of operating a lathe machine and milling machine, the skill of operating a lathe machine and a milling machine, work accuracy, and work consistency. It is a key to developing performance (De Porter & Hernacki, 1999).

2.4 Teaching Strategies and Feedback at the Higher National (HND) Level

A teaching method which places great emphasis on immediate feedback at each stage of a student‟s progress through course units, the Personalised System of Instruction (PSI), has been demonstrated in many studies to improve student performance (Kulik*et al*., 1980). If students do not receive feedback fast enough then they would have moved on to new content and the feedback is irrelevant to their ongoing studies and is extremely unlikely to result in additional appropriate learning activity, directed by the feedback.

The advent of new technologies resulted in „the knowledge explosion‟, with the consequence that information is much more transient than was previously considered to be the case. Different approach to teaching must be considered, to enable learners to develop a different skill set and be able to seek out, analyse and evaluate information rather than to simply accumulate knowledge,(Breivik, 1998).

2.4.1 Scholarship of teaching

The National Committee of Inquiry into Higher Education [NCIHE] (1997), otherwise known as the Dearing Report, highlighted the growing need to explicitly reward excellence in teaching and proposed that greater attention be paid to the skills development of academic staff involved in teaching students. UK proposed the initiation of the Institute for Learning and Teaching in Higher Education [ILTHE] (2004), to provide a professional body specifically relating to

higher education teaching.However, the scholarship of teaching has now achieved a greater level of importance and it has become almost fashionable to quote in all papers and publications relating to academic practice or educational development Ernest Boyer‟s four categories of „scholarship‟, namely the scholarship of discovery, integration, application and teaching(Boyer, 1990).

2.4.2Assessment of student teaching and learning

Gibbs, (1999) Guidance on how to implement a wide range of assessment tactics can be found elsewhere that enable a teacher to select appropriate assessment tactics. This assessment works best to support teaching and learning when a series of conditions are met. Students described all aspects of their study what they attended to, how much work they did and how they went about their studying as being completely dominated by the way they perceived the demands of the assessment system.

It has been claimed that students have become more strategic with their use of time and energies since the 1970s and more, rather than less, influenced by the perceived demands of the assessment system in the way they negotiate their way through their studies (MacFarlane, 1992).

2.4.3 The Effectiveness of Feedback in Teaching

Hattie (1987), reported that the most powerful single influence of teaching is feedback. Similarly, comprehensive review of formative assessment emphasizes the extraordinarily large and consistent positive effects that feedback has on learning compared with other aspects of teaching. (Black &Wiliam‟s 1998) There have been many attempts both to understand the nature of this impact and to

harness its power through innovation, at least in schools, as a consequence of this incontrovertible evidence.

In higher education, feedback to individual students in class must have declined significantly as class sizes have increased,. Writing comments on assignments, however, remains a major component of teachers‟ workload in higher education. As class sizes have increased there have been some economies of scale in teaching (simply by packing more students into classrooms), and teachers can find themselves spending much of their time marking. However, „Teaching staff normally give helpful feedback on how one is going‟ (Ramsden, 1992, p.107).

Maclellen (2001) surveyed 80 lecturers at the University of Strathclyde about their perceptions concerning assessment. Most teachers responded that feedback is frequently helpful in detail, frequently helps students to understand and frequently helps learning.

There may be a problem here with the quantity and quality of feedback such that it is not actually helpful to students after all, teachers are under enormous time pressure and it is difficult to provide comprehensive and useful feedback under such circumstances.

Feedback is often not read at all or not understood „Some students threw away the feedback if they disliked the grade, while others seemed concerned only with the final result and did not collect the marked work.‟ by (Hounsell, 1987).

2.4.4 Grade-less assessment

A grade is likely to be perceived by the student as indicating their personal ability or worth as a person as it is usually „norm-referenced" and tells you, primarily, where you stand in relation to others. A poor grade may damage a student"s „self-efficacy", or sense of ability to be effective. Yorke (2001) elaborates on the positive or negative ways in which formative assessment can affect student retention and emphasizes its role in „academic integration" (Tinto, 1993).

In contrast, feedback on its own is more likely to be perceived as a comment on what has been learnt. In the absence of marks it has been reported that students read feedback much more carefully and use it to guide their learning (Black &Wiliam, 1998). In the light of this (school-based) research evidence, some schools have adopted policies that all assignments should only have feedback and that no marks should be provided.

In the context of higher education. School-based research has identified lists of effects of formative assessment by teachers stated below, based on Gagne (1977):

1. Reactivating or consolidating prerequisite skills or knowledge prior to introducing the new material
2. Focusing attention on important aspects of the subject
3. Encouraging active learning strategies
4. Giving students opportunities to practise skills and consolidate learning
5. Providing knowledge of results and corrective feedback

6. Helping students to monitor their own progress and develop skills of self-evaluation
7. Guiding the choice of further instructional or learning activities to increase mastery
8. Helping students to feel a sense of accomplishment.

Subject areas with less frequent assessed tasks for example, text-based subjects have students who study fewer hours (Vos, 1991). Science and technology subjects that generate greater total study effort tend to have more frequent though smaller assessed tasks, such as problem sheets and laboratory reports. Teaching by engages students in productive learning activity of an appropriate kind:This issue concerns the kinds of study and learning activity involved in tackling the assignment or in preparing for tests.

Scouler & Prosser (1994), agree that, approach of students learning to exams may have as much impact as the form of test. Macdonald (2002) has reported that at least some students adopted a deep approach to examination revision and learning effectively as a result of the integration of material that are involved. Much teaching strategies simply fails to engage students with appropriate types of learning. Assignments are the main way in which such practice is generated. Students are unlikely to engage seriously with such demanding practice unless it is assessed, or at least required, by the assessment regulations.

The influence of feedback on teaching and learning: „Knowing what you know and don‟t know focuses learning. Students need appropriate feedback on performance to benefit from courses. In getting started, students need help in

assessing existing knowledge and competence. In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during college, and at the end, students need chances to reflect on what they have learnt, what they still have to learn, and how to assess themselves."(Chickering & Gamson, 1987)

Conventionally, feedback is conceptualized as an issue of „correction of errors" or „knowledge of results" in relation to learning itself; if a student is informed that she is accurate then she will learn. (Bruner, 1974)

Teaching feedback which tells students exactly where they have gone wrong and what they can do about it. Grades without feedback may be particularly damaging. A focus of critical feedback on personal characteristics can be demotivating and can negatively affect students" „self-efficacy" or sense of competence. This is important because self-efficacy is strongly related to effort and persistence with tasks (Schunk, 1984).

Feedback from assignment concerns the relationship of feedback to what an assignment has been set for and what counts as a successful attempt at the assignment. Feedback can perform several functions. For example it can be used primarily to:

- correct errors
- develop understanding through explanations
- generate more learning by suggesting further specific study tasks to promote the development of generic skills by focusing on evidence of the use of skills rather than on the content

- promote meta-cognition by encouraging students‟ reflection and awareness of learning processes involved in the assignment
- encourage students to continue studying.

A recent study at the Open University suggested that maintaining motivation was the most important and influential issue for new students for their first assignment in a course (Gibbs & Simpson, 2002). If a student is looking for encouragement and only receives corrections of errors this may not support their learning in the most effective way.

Students need to understand criteria in order to orient themselves appropriately to the assignment task. Penny & Grover (1996) have reported the extent to which students misunderstood the criteria to be used to assess their final year research project. The students expected criteria to be concerned with low-level goals such as style and presentation while their teachers emphasized high level goals such as theoretical and conceptual understanding. Opportunities to provide feedback at multiple stages during an ongoing project can re-orient student effort in appropriate ways (Carless, 2002).

Students' conceptions of learning

Underlying the above, students‟ confusion about what the tutor really wants could be an unsophisticated conception of learning.

Säljö (1982) describes students as having one of five conceptions of learning:

1. Learning as passive receipt of information
2. Learning as active memorization of information
3. Learning as active memorization of information or procedures, to be used at some time in the future

4. Learning as understanding

5. Learning as a change in personal reality: seeing the world differently.

Similarly, Higgins *et al*. (2001) discuss the failures of communication that take place in feedback. They describe a case in which the tutor‟s entire feedback consisted of: „A satisfactory effort‟. More critical analysis of key issues would have helped, the student, who wanted to be better than „satisfactory‟, was left frustrated by the poor quality of critical analysis by the tutor.

2.5 Strategies' For Teaching Competencies on Conventional Lathe Machine

2.5.1 Technical and Vocational Competency

Teaching of vocational competency can be accurately carried out if it includes knowledge, skill, and work attitude aspects. Besides, assessment can also be viewed from a variety of determinant factors directly related to competency attainment, such as a learning model and students‟ personality characteristics. Thus, a comprehensive model of effective competency assessment and components that constitutes a model of technical competency assessment of industrial engineering students of vocational high school. The competency attainment depends on the learning quality (learning style).

The learning style, according to Hermanussen, DeJong & Wierstra (2000), is a combination of several learning activities applying certain teaching-learning situations. In general, a *model* is one the strategies for teaching competencies and can be defined as a physical replication that describes a fact that model is a concept pragmatically displayed, which can be an instrument, tool procedure, or

new system. Therefore, a model can be defined as a result of the simplification of a complex process and system so that it is easy to understand and explain.

2.5.2Personality Construct of Competency

Aiken (1999) states that learning outcomes are influenced by personality. Therefore, competency can be explained by the learning style construct. On the basis of the results of several studies, it can be stated that competency can be explained by the personality construct. Therefore, theoretically there are two dominant constructs to explain competency, namely the learning style and the personality.

In the context of technical and vocational education, the work-based learning style is another strategy for teaching competencies and is relevant to be applied in vocational high schools.

2.5.3 Assessment of the Students' Competency

The Ministry of Education (2007) sets the criteria for the assessment of the students" competency; as follows

1. The technical competency construct consists of six indicators, namely work principle knowledge, work procedure knowledge, lathe practice skill, milling practice skill, work accuracy, and work consistency.
2. The learning style construct consists of two indicators, namely creativity development and innovative experience.

3. The personality construct consists of six indicators, namely achievement motivation, responsiveness, adaptiveness, progressiveness, enthusiasm, and self-confidence.
4. There a positive and significant reciprocal relationship between students „learning style and their personality; there a positive and significant relationship between students‟ learning style and their vocational competency; there a negative and significant relationship between students‟ personality and their vocational competency.
5. The model of vocational competency assessment as the PLC model consisting of three components, namely personality (P), learning style (L), and competency (C).

2.6 Performance Level of Students on the Conventional Lathe

2.6.1 Student Performance in Skills Test and Examination

Student performance, specifically, the common assessment points were a Skills Test and an Examination. The Skills Test was a practical test, designed to assess a student‟s ability to undertake skills developed through the module.

The cleaned data were then used to assess agreement between assessment points, following the procedure described by Bland & Altman (1986). The first part of this process involved calculating the arithmetic mean mark for each student, and the difference between the two marks for each student. The arithmetic mean of the differences was then calculated, and used to represent the accuracy or „biases. The standard deviation (SD) of the differences was also calculated, and used to represent the precision or „agreement‟.

Contrary to the view that students do consistently better in one form of assessment compared with another (Yorke *et al*., 2000), the findings from the present study suggest that this is not the case. When comparing performance in two assessment points within each module, relative student performance varies as a function of the average mark from the two assessment points.

In this case, students consistently scored better in the Skills Test. The notion that examinations yield lower levels of performance than other forms of assessment is not evident from the present study (Yorke *et al*., 2000). The relative performance in the examination appears, in general, to be a function of student level of performance. (Elton & Johnston, 2002), further commonly made claim that strong students score relatively better in an examination and also appears not to be the case. Students with a high level of performance scored relatively worse or relatively better in the Examination.

2.7 Assessing Competencies and Strategies on Conventional Lathe Machining

2.7.1 Applying a Scholarly Approach

Ramsden, (1992) found that, it is known from research into student learning that assessment essentially drives the curriculum and furthermore that assessment in itself should constitute an episode of teaching, (Stefani, 1998).

Therefore it is fundamental to effective teaching that assessment is seen as an integral part of the teaching and learning contract, thus the facilitation of student learning and the assessment of student learning.However, to succeed in the quest is to encourage, support and enable staff to take a scholarly approach to teaching, learning and assessment, even in the difficult circumstances currently face, then educational developers must themselves take a scholarly approach in this enabling task. This idea is affirmed by (Lueddeke 1997) and (Middleton 1998).

2.7.2 Reflective Practice in Assessing Student

In broad terms, one of the key goals of higher education can be expressed as enabling students to become autonomous, independent learners (Boud, 1995). The concept of reflection has now become a more fundamental aspect of teaching and learning in higher education and has had an impact on the „what" and the „how" of assessment of student learning.

Working with academic staff accustomed to thinking in their disciplinary language (Becher, 1989), state that reflection" as a concept must be unpackaged into different terms, which may be seen to have meanings compatible with the knowledge, understanding, skills and attitudes which are key to different disciplinary domains. It is after all a tall order to shift one"s thinking towards teaching and assessing for the development of these higher order thinking skills, when essentially this is at odds with a „traditional" content-driven curriculum and assessment strategies which are primarily based on knowledge content.

2.7.3 Setting an Assessment Criteria

There is a natural lead in here to discussions on how academic staff set assessment criteria and whether they consciously, explicitly, link assessment criteria to the intended learning outcomes for the courses being offered. Lecturers often assess students on easily assessable matters, such as memorization of large bodies of factual material (Boud, 1995). In other words, staff sometimes actually rewards a surface approach to learning whereas the focus should be on how students use, interpret or criticize material to do something with it, taking a deep approach to learning.

Sharing the underlying principles of teaching, learning and assessment within workshop settings takes up a lot of time.Terms such as summative and formativeare clearly defined with ample scope for discussion on the importance of formative feedback to affirm student learning. There is always a considerable level of discussion relating to the difference between criterion-referenced assessment and norm- referenced assessment.

The key processes associated with assessment are:

- setting the criteria for assessing student learning in accordance with the learning outcomes
- ensuring a shared understanding between staff and students of the assessment criteria selecting the evidence that would be relevant to judge against these set criteria
- ensuring students understand the nature of evidence to be provided
- making judgments about the extent to which the assessment criteria have been met
- ensuring transparency of these judgments‟
- communicating assessment outcomes to students
- providing useful feedback to the students on the assessment outcomes.

2.7.4 Assessment Strategies

Assessment is one of the most powerful drivers of innovation and change in education, as it defines the goals for both learners and teachers‟. Department for Education & Skills‟ ([DfES], 2003, p.32). Assessment is recognized as probably

the most influential factor related to how students learn directly linked to effective teaching and learning by rewarding understanding and achievement. Brown & Glasner, (1999), said, „Successful learners most often rely on assessment deadlines and activities to both pace and direct their learning efforts. Effective teachers use assessment activities strategically to motivate learners to engage successfully in productive learning activities.“

Garrison & Anderson (2003, p.95) stated; the strategic use of assessment as an extrinsic motivator for learning is closely linked with assessment for summative purposes; any assessment forms part of a formative–summative continuum. At the formative end of the continuum, assessment is regular and provides advice and guidance on progress. At the other end of the continuum is „end of learning event“ assessment. However, assessment can be both formative and summative though it has been argued that over-reliance on assessment as an extrinsic motivator can lead to surface learning approaches (Bull *et al*, 2002).
(Brown & Glasner, 1999) Stated; Assessment can be used for a variety of reasons, including:

- providing feedback
- grading
- enabling students to correct errors
- motivating student
- consolidating learning
- applying abstract ideas to practical examples
- estimating students“ potential
- guiding selection or option choice
- giving staff feedback on how effective their teaching has been
- providing statistics for internal and external uses.

Providing feedback to students is a valuable part of the learning process and should be ongoing**,** frequent and comprehensive (Garrison & Anderson, 2003). The traditional practice of formative assessment is text-based feedback, providing advice and guidance on how to improve. But anecdotal evidence suggests that students do not fully exploit this feedback. Elton & Johnston (2002) indicate in their review that students do not take it seriously and are only interested in „what counts".

2.7.5 Computer-Aided Assessment

Computer-aided assessment (CAA) has been increasing within UK higher education, in part driven by the changing higher education environment increased student numbers, lower unit of resource, modularization, and increased flexibility. CAA can be used in a wide range of contexts; Bull *et al*. (2002) summarize these as:

- Diagnostic- ascertaining students" skills levels prior to learning events, that is audits
- Formative- carried out during a learning event
- Summative- carried out at the end of the learning event.
- CAA, enable the use of different assessment methods within a range of approaches, including peer-assessment, self-assessment, group-based assessment and objective testing.

Assessment methods involving ICT include case studies, mock exams, group projects and the creation of authentic learning tasks (Brown *et al*., 1999). CAA can encourage collaborative and reflective styles of learning. It is also possible for CAA to be adaptive, in that the outcomes of an assessment can be

used to determine further questions or information that the student needs to address. Thus it is possible to guide students through a programme based on their responses at key stages, in a way that is appropriate for their specific competency outcome. Charman (1999) identifies the following advantages of using CAA for formative assessment:

- Repeatability
- Immediacy of response to the student - providing a close connection between the
- immediacy of marks to staff for monitoring and adaptation
- Reliability and equitability
- Increasing the diversity of assessment
- Markers are not influenced by presentation
- Timeliness - potential for assessments to be used at the most appropriate time, for example weekly tests
- Flexibility of access, especially using the web
- Student interest and motivation
- Student-centred skills and learning - open access can encourage students to take responsibility for their own learningactivity and the feedback

Consequently, conventional forms of face-to-face teaching, learning and assessment are unlikely to meet student needs.

Peat & Franklin (2002) have identified that, coupled with the need for more support; students have higher expectations for quality formative feedback. This is particularly significant as the demands on students make it increasingly difficult for them to attend on-campus sessions in the „traditional" manner. Pressures on

students‟ time and changing expectations mean they are demanding more immediate feedback.

Brown *et al*. (1999, p.11) argue that CAA allows students to monitor progress at regular intervals, thus addressing one of the key elements of formative assessment. According to Peat *et al,* (2002, p.516) „Formative computer based assessment can produce improvement in student learning outcomes and this can lead to positive attitudes to learning. ‟Zakrzewski & Bull (1999) demonstrated a significant grade point increase in final results for students who worked through formative tests.

2.7.6 Categories of Assessment

Group-Based Assessment

A blog is a web page containing a series of short frequently updated postings in chronological order, in effect providing a personal publishing tool. This allows individuals to post reflective messages to which peers can then respond, so providing feedback, questioning and so forth - in other words, it can be used as a group tool.

Elton & Johnston (2002, p.15) note that „formative assessment thrives on students‟ openness, while summative discourages it.‟ Formative assessment requires students to put forward their initial ideas and understanding for „critique‟ and sharing. Students need to be encouraged to make public their ideas and the development of their thinking.

If formative assessment is a continuous process of feedback and support, it does not only have to come from the tutor. Participation can be encouraged

through the use of well-designed, authentic tasks; indeed, Garrison & Anderson (2003) believes that education should be a collaborative constructive experience, where understanding is developed in a critical community of inquiry.However, there is a strong feeling in the course team that the benefits of including group assessment far outweigh any such concern.

Peer-assessment

Involving the student in peer-assessment can encourage motivation, both through students looking at peers‟ work and knowing their own work will be peer reviewed; this can be a valuable experience, allowing students to measure themselves against others and compare their own assessments with those of their peers. A peer‟s comments may also have more impact than a tutor‟s and can be more critical. Brew (1999) makes a distinction between peer marking and peer feedback, indicating that peer feedback can help focus learning and be positive for a group of learners, whilst peer marking can be disruptive. It is obviously important that the process is managed to ensure consistency; and encouraging the students to develop the skills to evaluate and provide feedback.

Assessment needs to be „fit-for-purpose‟; that is, it should enable evaluation of the extent to which learners have learned and the extent to which they can demonstrate that learning (Brown & Smith, 1997). Consider not just what are to be assessing but *how* and which methods, approaches, and also the rationale for assessing on any particular occasion and in any context. Other reasons are to motivate students, encourage activity, and provide guidance and feedback for remediation, grading and selection. Rather than continuing to over-use unseen

time-constrained exams, essays and reports, assessment that are widely used in higher education institutions in the UK and internationally (Brown & Knight, 1994).

Any assessment strategy needs to be efficientin terms of staff time, cost-effective for the organizations concerned and should ensure that learners find the tasks they are set manageable, relevant and developmental. Students and staffs are not simply expected to just keep working harder and harder; where possible best use of the available technologies to make assessment more efficient (Brown *et al*., 1994).

Formative feedback is crucial. It needs to be detailed, comprehensive, meaningful to the individual, fair, challenging and supportive, which is a tough task for busy academics. The whole range of means available to make this possible, including computer-aided assessment and strategies for giving feedback efficiently such as assignment return sheets, assignment reports, in-class collective feedback and other means (Brown *et al.*, 1994).

Self-assessment

Self-assessment, peer-assessment and group assessment, none of which should be regarded as a „quick fix", because they take considerable briefing, training and rehearsal if they are to be effective, but can, when properly managed, save some staff time and they are extremely valuable in helping students interpret criteria.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

The procedure used in gathering information for the research work, can be found in this chapter to evaluate ‚An assessment of competencies of student‟s performance in conventional Lathe machining at the Higher National Diploma (HND) level‟ a study conducted in the selected polytechnics in Ghana specifically, Accra and Koforidua Polytechnics.

This research work is critical to discover facts about challenging situations confronting students competency performance skills in Lathe machining.

However, the methodology which would assist to arriving at the acceptable conclusion, involved population, sampling and sample size , instrumentation, validity and reliability of instrument, administration of questionnaire, research design, data collection technique and data analysis.

3.1 Population

The population needed was selected from the two (2) Polytechnics out of the ten in Ghana.

They are the Accra Polytechnic in the Greater Accra Region and Koforidua Polytechnic in the Eastern Region. These schools were chosen because the Accra Polytechnic in the Greater Accra Region falls in the average performance group of the older Polytechnics whiles the Koforidua Polytechnic in the Eastern Region is also among the average performance group of the latest establishes Polytechnics.

More so, this population was considered to have a holistic idea of what happens mostly in the department of mechanical engineering basically, ‚machine

tools workshops". The population covered the lecturers or instructors together with mechanical engineering students in those selected institutions.

3.2 Sampling

In general, students" population in the above mentioned department of the various institutions were sampled for the research work. The researcher is of the view that the level, of all students in the second and third year, regardless of sex (male or female) had been introduced to the operation of the lathe machine in the mechanical engineering workshops, and had made advancement in practical exercises or operating skills on the conventional lathe machine in the Engineering. Machine workshop. The researcher further included the Lecturers/Instructors handling practical lessons in these departments, since they also contribute to the competency of the students" performance at the workshop.

3.3 Sample size

Random sampling method was used for the selection to make sure there was a well balance of Population sampled. Meanwhile eighty (80) students were selected at the two (2) institution mentioned, comprising of forty (40) student from each institution of which there were no gender balanced consideration. Students were given well designed questionnaires to answer and being guided by the researcher and other lecturers for proper administration of the questionnaire In order to avoid rush, enough time was given to them to answer the questions.

Twenty (20) lecturers/instructors also answered well structured questions from the two (2) selected institution, comprising of ten (10) lecturers/instructors from each

institution. This assisted the researcher to know whether they were competent enough or had had skill training in the technological field and as such could handle practical lessons in conventional lathe machining. Frankly speaking, lecturers/instructors were not guided in answering the questions since they were matured.

3.4 Instruments

The instruments used in this research work were:

- Questionnaire
- Interviews (unstructured) and
- Observations.

Questionnaires for students demanded a dichotomous answer as such it was set objectively which enable the researcher to seek fast information since it administration is very fast. Likewise the questionnaires for the lecturers/instructors, with few subjective ones. Questionnaires and interviews were used by the researcher to convert into data the information directly given by persons. This approach helped the researcher to measure the knowledge, values, preferences, attitudes and beliefs.

Questionnaires and interviews could be used to discover what experiences have taken place and what is occurring. It is believed that through the instruments ideas and suggestion is put forward and enable the solution to be found to the situation.

More so, the unstructured interviews enabled the researcher to have more information to analyze the actual problem and suggest possible solution to it.

Observations used added the feel of what actually happens on the workshop grounds that is conventional lathe machine operation situation and its environment.

3.5 Validity and Reliability of Instrument

The validity and reliability of the instrument suppose to measure what the researcher intended to find out. The drafted questionnaire items for both lectures and students were submitted to a lecture in one of the selected institution for security, ambiguity, comments and suggestions. After the approval of the questionnaire, a pilot study was conducted for pre-test with a third year student which depicted some difficulties in responding to some of the questions and Proper construction of items in technical (engineering) terms. These were then restructured for easy understanding and respond before they were given out to the respondent

3.6 Administration of the Questionnaire

An introductory letter was collected from the „department of design and technology" to be submitted to the selected institution in order to make the administration of the questionnaire very official. Permission was granted from the heads of departments in the selected institution and this was carefully planned not to disrupt the academic activities of these groups. Practical periods were used to administer these questionnaires by the help of the class secretary to administer them at the appropriate time as they were informed to retrieve them within a given period. An item which was not clear to the students was carefully explained by the

researcher. Lectures/instructors questionnaires were also administered simultaneously. Respondents were assured of the fact that their information was for research purposes only and the confidentiality of the information would be secured meanwhile, the.Administration of the questionnaire for the various institutions was done on different days.

3.7 Research Design

This research work is being done by using a survey which involve studying and investigating to discover facts about the situation which would help to arrive at an acceptable conclusion, a case study in Accra Polytechnic and Koforidua Polytechnic. However, information received from the sample population was described using statistical devices in a systematic and realistic manner to summarize on the topic.

3.8 Data collection

The researcher administered questionnaires to students together with the lecturers/instructors through the concern of the institutional mechanical Head of department and some of lecturers in the sampled institutions.

However, the collection of the data from the respondents involved visiting the various institutions on the given informed day to retrieve the questionnaires and took the opportunity of that period to interview some of the students and lectures at random and particularly observed the machine shop environment.

CHAPTER FOUR: DATA ANALYSIS

4.0 Introduction

The result of the study was based upon the data of information gathered from the questionnairesand the interviews together with the observations made which were considered and its central fact were used for the findings.The researcher collected the data and expressed them in tables, pie chart, bar chart and percentages in analyzing them. Each question in the questionnaire was considered separately and independently to be analyzed from each other. This chapter also brings to bare, the researchers data analysis of questionnaires for students and instructors and the higher percentage of response of various questions was taken as adequately valid and reliable with regards to the findings.

4.1 Data Analysis of Questionnaire for Students

4.1.1 DataAnalysis on Background

The random sampling method was used for the selection of the (80) eighty students, comprising of (40) forty students from each institution answered related question in their field of study.

Department and Area of specialization: The (80) eighty students who responded to the questionnaire from the two institutions were all from the mechanical department and their area of specialization were mechanical engineering which had made the responses that appear more frequently to be taken as the general overview of the respondents on that particular issue.

Table 1-6,and figure 2-4presents student data analysis. (Institution: A-Koforidua poly,B-Accra poly).

The general result below shows how long students have been using workshop related to their special field of study.

Table1: Period of using workshop of special field

Response(s)	**Institution**		**Total**	**Percentage**
	A	**B**	**number**	
More than 4 years ago	0	0	0	0%
3 years	12	20	32	40%
2 years	6	8	14	17.5%
1 year	16	4	20	25%
Less than 1 year	6	8	14	17.5%

The above table indicates that, none of the students spent more than 4 years whiles 32 students representing 40% spent 3years, 14 student"srepresenting17.5% spent two years, 20 representing 25% spent 1 year and another 14 representing 17.5% spend less than 1 year. The analysis indicates that 66 representing 82.5% were in year three to yearone and the remaining 14 representing 17.5% would appear tobe part-time students.

The researcher tends to find out in the table below, how often students attend practical training lessons on the lathe machine within a week.

Table2: Frequency of Practical Period within a Week

Response(s)	**Institutions**		**Total number**	**Percentage**
	A	**B**		
More than three times a week	O	4	4	5%
Thrice a week	0	0	0	0%
Twice a week	2	0	2	2.5%
Once a week	18	28	46	57%
Not at all	20	8	28	35%

The result above shows, Only 4 representing 5% attend practical lesson more than three times a week, none of the student attend practical training thrice a week while 2 representing 2.5% agree to attend practical training twice a week with 46 representing 57% testify to attend practical training once a week and 28 representing 35% standing for not attending practical training at all.

According to the curriculum of the Higher National Diploma (HND) students are obliged to attend practical classes for average of ten (10) hours per a week.

Respondents were asked about the hours they spend on the lathe machine during practical training or lessons.

Table3: HoursSpent per Practical Lesson

Response(s)	**Institutions**		**Total number**	**percentage**
	AB			
More than 1 hour	14	10	24	30%
1 hour	2	12	14	17.5%
30 minutes	0	6	6	7.5%
20 minutes	22	4	26	32.5%
None	2	8	10	12.5%

The result above shows that, 24 representing 30% agree to have their practical more than one (1) hour, 6 representing 7.5% spend 30 minutes, with 14 representing 17.5% use one (1) hour on the practical training, as 26 representing 32.5% accept 20 minute and 10 which represent 12% stand for none hours given. The general result indicates that, 38 representing 47.5% spend average of one(1) hour, whiles 32 representing 40%also spend average of less than one(1) hour but institution A, have 22 greater number representing 27% spending less than one(1) hour on the practical lesson.

The researcher was trying to find out whether the students have extra time for practical lesson.

Table 4: Do Students have Extra time for Practical Lessons?

Response(s)	**Institution**		**Total number**	**Percentage**
	A	**B**		
Yes	2	2	4	5%
No	28	32	60	75%
Sometime	10	6	16	20%

In trying to find out about students extra time, thedata above shows that, 4 said Yes representing 5% and 60 students representing 75% responded no while 16 representing 20% agree to have extra period sometime.

The following table shows the results about how the workshop is well equipped with conventional lathe machine for practical training.

Table 5: Workshop well Equipped forPracticalTraining.

Response	**Institution**		**Total**	**Percentage**
	A	**B**	**number**	
Yes	12	30	42	52.5%
No	28	10	38	47.5%

The table above shows that, 42 representing 52.5 % ticked Yes whiles 38 students representing 47.5% accepted No. Based on the number of each institutional response, the respondent in general, 30 representing 37.5% out of 52.5% said Yes for institution A, while 28 representing 35%out of 47.5% said No for institution B.

Both, figure 2 and 3 were used to analyze the question, about the ratio of students to a machine during practical training for institution A and institution B respectively.

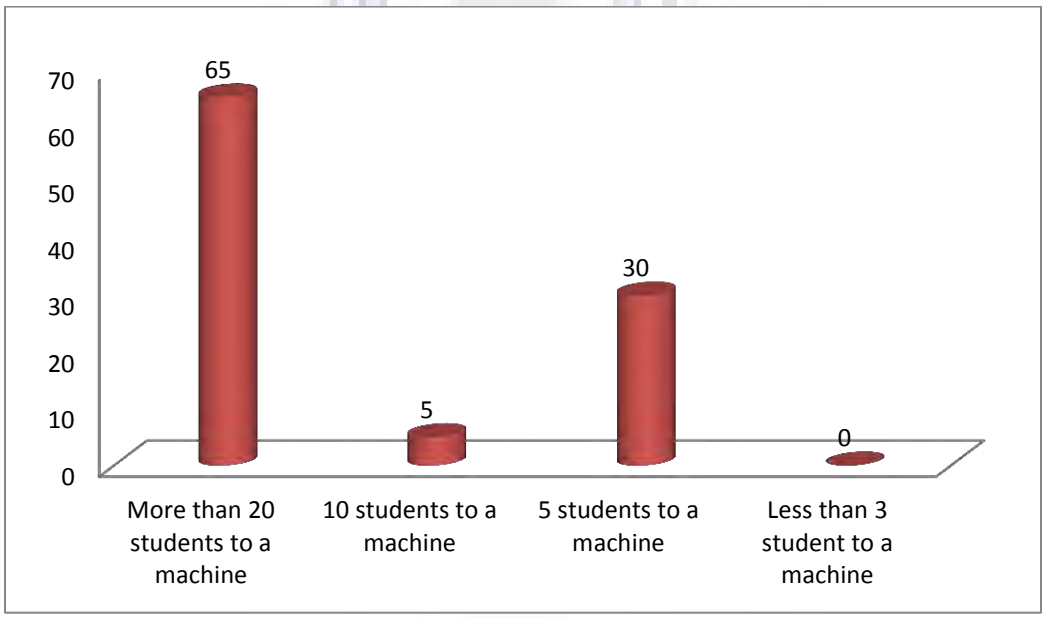

Figure1: Ratio of Students to a Machine.-Institution A.

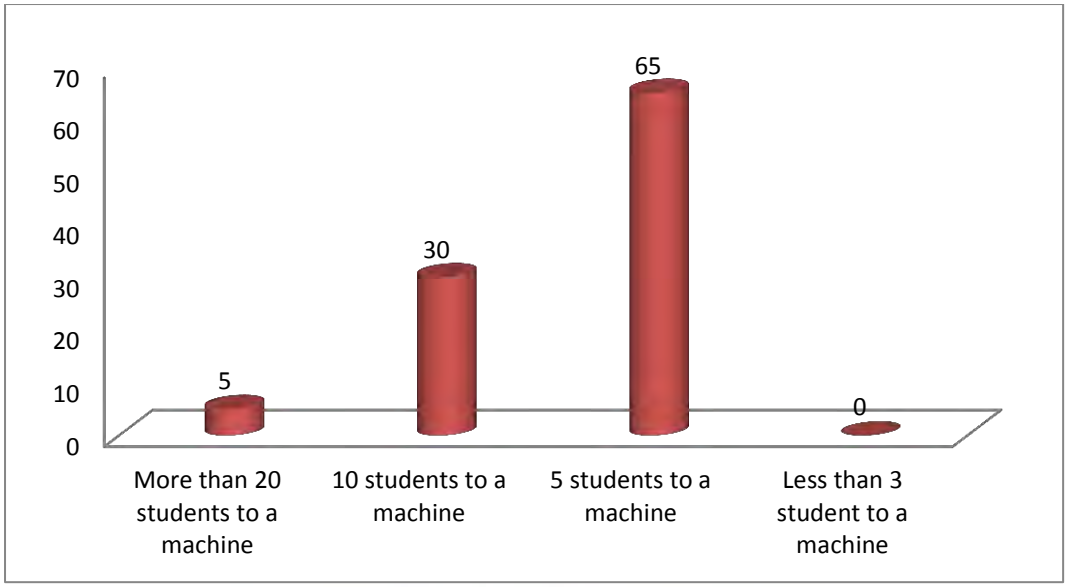

Figure2: Ratio of Students to a Machine; Institution B.

The general result shows that, for institution A, fig 2 above shows 26 students representing 65% accepting more than 20 students to a machine, 2 students representing 5% said ten(10) students to a machine, with 12 students representing 30% choosing five(5) students to a machine, whiles for institution B, fig 3 above shows 2 students representing 5% said more than twenty(20) students to a machine,12 students representing 30% ticked ten(10) students to a machine, whereas 26 representing 65% agree to five(5) students to a machine.The general analysis from the table indicates that institution A, recorded greater value for higher ratio as institution B recorded greater value for lower ratio.

The pie chart below was used in general, for both institutions in finding out from students whether practical lesson are well organized by the instructors.

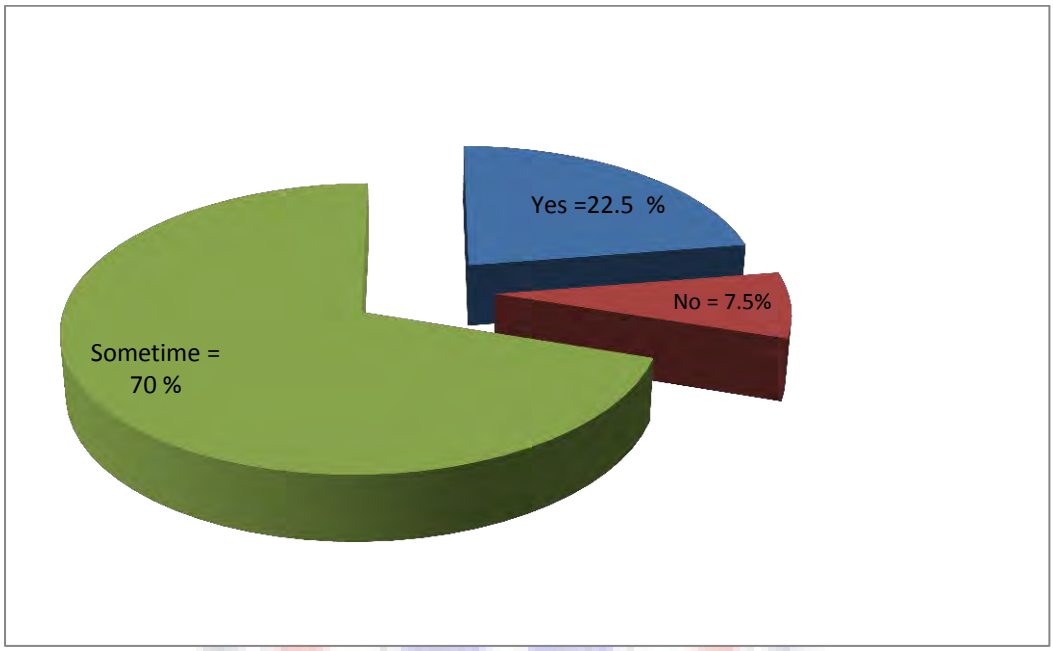

Figure 3: Practical Lesson well Organized.

The pie chart above clearly shows that 18 students representing 22.5% chose Yes, with 6 students representing 7.5% having the idea of No, and 56 students of 70% agree to the fact that practical lesson sometimes are well organized.However bothinstitutions responded averagely toeach item.

4.1.2. Data analysis onStudents'Competencies.

The table 6below gives the response to the items of the students on competence in the questionnaires, which were objective in nature.

Table 6: Data analysis for Students' Competencies

Questions	Response	Institution		Total number	Percentage
		A	B		
11. Lubrication, belt tension,	Strongly agree	8	2	10	12.5
	Agree	14	20	34	42.5
switches are checked before	Disagree	10	14	24	30
	Strongly	8	2	10	12.5
starting the lathe machine.	disagree	0	2	2	2.5
	Don't know				
12. The lathe machine can	Strongly agree	6	16	22	27.5
perform almost all the	Agree	30	18	48	60
operations than any other	Disagree	4	6	10	12.5
mechanical machine.	Strongly	0	0	0	0
	disagree	0	0	0	0
	Don't know				
13. Operating the lathe	Strongly agree	12	20	32	40
machine requires more	Agree	20	12	32	40
alertness than any other	Disagree	6	6	12	15
machine.	Strongly	2	2	4	5
	disagree	0	0	0	0
	Don't know				
14. The chucks are the only	Strongly agree	4	8	12	15
means of holding	Agree	8	12	20	25
components on the lathe	Disagree	20	12	32	40
machine.	Strongly	8	8	16	20
	disagree	0	0	0	0
	Don't know				

15. Setting work in the three-jaw chuck is more difficult than in the four-jaw chuck.	Strongly agree Agree Disagree Strongly disagree Don‟t know	0 2 20 18 0	4 6 14 16 0	4 8 34 34 0	5 10 42.5 42.5 0
16. The four-jaw chuck gives much precision in setting work on the lathe.	Strongly agree Agree Disagree Strongly disagree Don‟t know	14 20 2 4 0	20 12 6 2 0	34 32 8 6 0	42.5 40 10 7.5 0
17. The turning operation is done on the lathe machine mostly with the compound slide.	Strongly agree Agree Disagree Strongly disagree Don‟t know	6 12 18 4 0	6 28 4 2 0	12 40 22 6 0	15 50 27.5 7.5 0
18. The cross slide is mostly used when performing facing of component.	Strongly agree Agree Disagree Strongly disagree Don‟t know	14 18 4 4 0	12 16 8 4 0	26 34 12 8 0	32.5 42.5 15 10 0
19. The cross-slide and the compound slide move in the same direction.	Strongly agree Agree Disagree Strongly disagree Don‟t know	0 8 12 18 2	2 6 20 8 4	2 14 32 26 6	2.5 17.5 40 32.5 7.5
20. Mandrels are used to enable a bored work piece to be located between centers on the lathe.	Strongly agree Agree Disagree Strongly disagree Don‟t know	16 20 0 0 4	12 20 4 0 4	28 40 4 0 8	35 50 5 0 10

21. Drilling and boring operations on the lathe machine are the same.	Strongly agree	0	6	6	7.5
	Agree	6	14	20	25
	Disagree	12	10	22	27.5
	Strongly	20	8	28	35
	disagree	2	2	4	5
	Don‟t know				
22. Drilling and boring operations all requires proper use of the tail-stock measurement.	Strongly agree	4	16	20	25
	Agree	6	20	26	32.5
	Disagree	8	2	10	12.5
	Strongly	20	0	20	25
	disagree	2	2	4	5
	Don‟t know				
23. Reamers are used on the lathe to check size of drilled holes.	Strongly agree	2	2	4	5
	Agree	2	14	16	20
	Disagree	14	4	18	22.5
	Strongly	20	14	34	42.5
	disagree	2	6	8	10
	Don‟t know				
24. Tabs and dieses can be used on the lathe machine to cut threads.	Strongly agree	4	10	14	17.5
	Agree	8	14	22	27.5
	Disagree	6	2	8	10
	Strongly	20	14	34	42.5
	disagree	0	2	2	2.5
	Don‟t know				
25. Parting-off, undercut, knurling are special operations that requires special tools on the lathe.	Strongly agree	26	30	56	70
	Agree	12	8	20	25
	Disagree	0	0	0	0
	Strongly	2	0	2	2.5
	disagree	0	2	2	2.5
	Don‟t know				

26. Instructors allow students to operate lathe machine at their own leisure time.	Strongly agree Agree Disagree Strongly disagree Don‟t know	0 10 10 20 0	8 16 6 10 0	8 26 16 30 0	10 32.5 20 37.5 0
27. Students operate the lathe machine at their own leisure time.	Strongly agree Agree Disagree Strongly disagree Don‟t know	2 4 12 22 0	0 6 14 20 0	2 10 26 42 0	2.5 12.5 32.5 52.5 0
28. Micrometer, vernier caliper and steel rule are normally used to measure component being produced by the use of the lathe machine.	Strongly agree Agree Disagree Strongly disagree Don‟t know	30 10 0 0 0	26 14 0 0 0	56 24 0 0 0	70 30 0 0 0
29. Plug gauge, snap gauge, outside and inside caliper are normally used for checking component that are being produce by the lathe machine.	Strongly agree Agree Disagree Strongly disagree Don‟t know	16 20 0 0 4	10 26 2 2 0	26 46 2 2 4	32.5 57.5 2.5 2.5 5
30. Work is being set with the dial TestIndicator (DTI) and scribing block before starting machining a component.	Strongly agree Agree Disagree Strongly disagree Don‟t know	14 20 0 0 4	22 14 2 2 0	36 34 4 2 4	45 42.5 5 0 7.5

Item eleven was to ascertain whether lubrication, belt tension and switches of lathe machine are checked before starting it.

The result indicate that 12.5% Strongly Agree, 42.5% Agree, 30% Disagree, 12.5% Strongly Disagree and 2.5% even don‟t have any idea about it.

Item twelve which state that lathe machine can perform almost all operation than any other mechanical machine, 27.5% Strongly Agree, 60% Agree and 12.5% Disagree to all the fact Lathe machine is a multi-operational machine. Item thirteen shows that operating the lathe machine requires more alertness than any other machine 40% Strongly Agree, 40% Agree, 15% Disagree and 5% Strongly Disagree to the alertness of the lathe machine.

Item fourteen indicates that 15% strongly Agree, 25% Agree, 40% Disagree and 20% Strongly Disagree to the question chucks being the only means of holding component on the lathe machine.

Item fifteen depicts that, setting work in the three- jaw chuck is more difficult than the four-jaw chuck. 5% Strongly Agree, 10% agree, 42% Disagree and another 42.5% Strongly Disagree.

Item sixteen responded by students that, the four jaw-chucksgives much precision in setting work on the lathe. 42% Strongly Agree, 40% Agree, 10% Disagree and 7.5% Strongly Disagree.

Item seventeen ascertain that turning operation is done on the lathe machine mostly with the compound slide. 15% Strongly Agree, 50% Agree, 27.5% Disagree and 7.5% Strongly Disagree.

Item eighteen analyze whether the cross slide is mostly used when performing facing of component. 32% Strongly Agree, 42.5% Agree, 15% Disagree, and 10% Strongly Disagree.

Item nineteen of the questionnaire asked whether the cross-slide and the compound slide move in the same direction. 2.5% Strongly Agree, 17.5% Agree, 40% Disagree, 32.5% Strongly Disagree and 7.5% have no idea about the function of the part.

Item twenty states, Mandrels are used to enable the bored work piece to be located between centers on the lathe. 35% strongly Agree, 50% Agree, 5% Disagree and 10% have no knowledge about the type of work holding in the lathe machine.

Item twenty-one was trying to find out whether drilling and boring operations are the same on lathe machine. 7.5% Strongly Agree, 25% Agree, 27.5% Disagree, 35% Strongly Disagree and 5% have not heard about the difference between drilling and boring.

Item twenty-two asked that drilling and boring operation all requires proper used of the tail stock measurement. 25% Strongly Agree, 32.5% Agree, 12.5% Disagree, another 25% Strongly Disagree and 5% do not know anything about drilling and boring operation on the lathe machine.

Item twenty-three indicates to the question, reamers are used on the lathe to check size of drilled holes, 5% strongly Agree, 20% Agree, 22.5% Disagree, 42.5% Strongly Disagree and 10%have not experience the used of reamers on the lathe machine.

Item twenty-four shows the response to the question, Tapes and Dieses can be used on the lathe machine to cut threads, 17.5% Strongly Agree, 27.5% Agree, 10% Disagree, 42.5% Strongly Disagree and 2.5% do not have any idea about whether taps and dieses could be used on the lathe machine.

Item twenty-five: Parting –off; under cut, and knurling are special operations that requires special tools on the lathe, 70% Strongly Agree, 25% Agree, 2.5% Strongly Disagree and the remaining 2.5% do not have any knowledge about these special operation.

Item twenty-six reveals the analysis of the question whether instructors allow students to operate the lathe machine at their own leisure time, 10% Strongly Agree, 32.5% Agree, 20% Disagree and 37%Strongly Disagree that instructors do not permit students to operate the lathe machine at their leisure period.

Item twenty-seven demands the opinion of the student as they operate the lathe machine at their own leisure time, 2.5% Strongly Agree, 12.5% Agree, 32.5% Disagree and 52.5% Strongly Disagree, indicating that most the students do not make an attempt to have their own time to operate the lathe machine.

Item twenty-eight depicts data to the question whether micrometer, venier caliper and steel rule are normally used to measure component being produced by the lathe machine. 70% Strongly Agree, 30% Agree showing that students appear to have a theoretical idea about the precision instrument use on the component machined by the lathe.

Item twenty-nine shows as to whether plug gauge, snap gauge, outside and inside caliper are normally used for checking components that are being produce by the lathe machine, 32.5% Strongly Agree, 57.5% Agree, 2.5% Disagree, 2.5% Strongly Disagree and 5% do not have any suggestion about checking mechanical components with gauges.

Item thirty of table six also ascertain the analysis on work being set with the dial test indicator (DTI) and scribing block before starting machine component in the lathe machine, 45% Strongly Agree, 42% Agree, 5% Disagree, and 7.5% having no idea about work setting instrument.

4.2 Data Analysis of Questionnaire for Instructors

The ten (10) instructors from each institution answered question in their field. The actual situation on the ground is analyzed using bar chart, pie chart and tables.

Department and Area of Specialization

The twenty(20) instructors comprising of ten(10) from each institution were all in the mechanical department and the area of specialization were mechanical Engineering and at least each instructor selected made responses to the items with regards to the teaching experience.

Data Analysis for Instructors. Institutions: A- koforidua poly, B- Accra poly.

The table below clearly shows the response to the question – how long have you been using the workshop related to your special field of study.

Table7: Period of Using Workshop Related

Response	**Institution**		**Total number**	**Percentage**
	A	**B**		
More than 4 years ago	5	5	10	50%
3 years	5	5	10	50%
3 years	0	0	0	0%
1 year	0	0	0	0%
Less than 1 year	0	0	0	0%

The table above clearly shows average, ten (10) instructors representing 50% accepted more than 4 years, the remaining ten (10) instructors that are 50% recorded 3 years ago.

The following table highlights the individual instructors‟ response in relation to the year group or class in which they handle practical lessons.

Table8: Year group of taught practical lesson

Response(s)	**Institution**		**Total**	**Percentage**
	A	**B**	**Number**	
Year One	4	4	8	40%
Year Two	0	0	0	0%
Year Three	6	6	12	60%
Others	0	0	0	0%

The result of the response show that 8 instructors representing 40% for both institution, teach year one students, whiles the 12 instructors representing 60% for both institution teach the year three students, but recorded 0% to teach the year the two students.

Respondents were asked to rate whether the functions of the conventional lathe machine parts were beingintroduced before operating it.

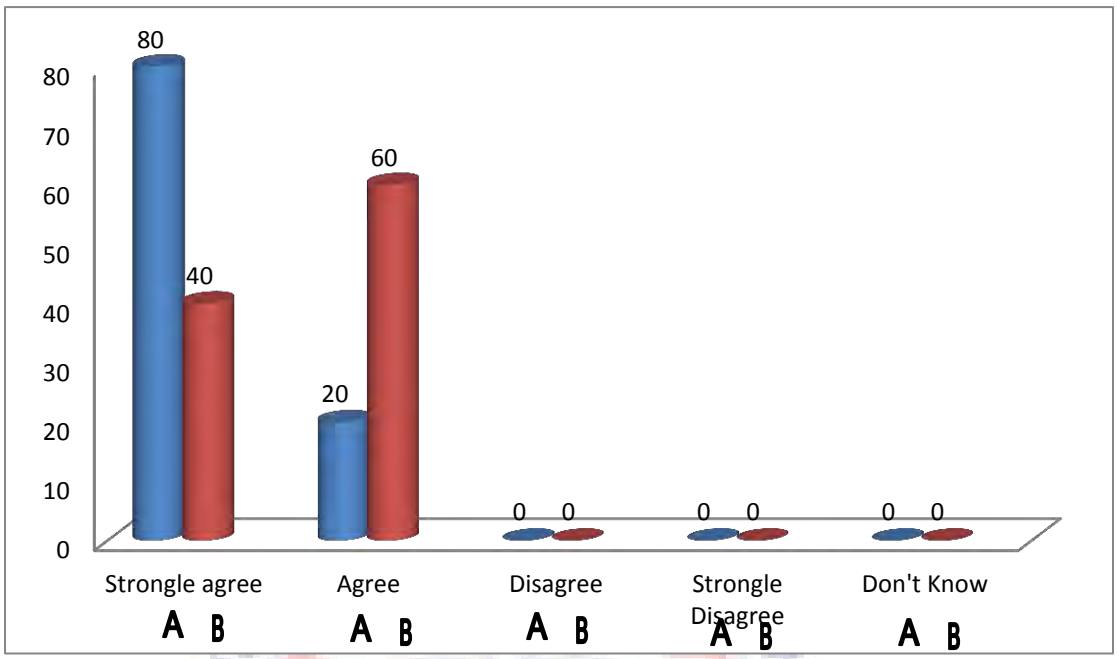

Figure4: Functions of Lathe Parts Well Introduced to Students

The figure above depict 8 instructors representing 80% and 2 representing 20% ticked Strongly Agree and Agree respectively for institution A. Whiles 4 representing 40% and 6 representing 60% also accepted Strongly Agree and Agree respectively for institution B. The total outcome of both institution 12 representing 60% Strongly Agree and 8 representing 40% Agree, all gave an assurance that functions of parts of conventional lathe are well introduce to students before operating machine.

In the table below, question was asked to inquire from respondents to evaluate whether enough contact hours are given to practical lesson on the timetable.

Table9: Contact Hours forPractical Lesson

Response(s)	**Institution**		**Total**	
	A	**B**	**Number**	**percentage**
Strongly Agree	**0**	4	4	20%
Agree	2	0	2	10%
Disagree	6	6	12	60%
Strongly disagree	2	0	2	10%
Don‟t know	0	0	0	0%

The data obtained in table 9 above shows that, 4 instructors representing 20% said Strongly Agree, 2 representing 10%, accept Agree, 12 representing 60% said Disagree and 2 representing 10% ticking Strongly Disagree. The result above shows that 14 instructors representing 70% disputed the fact that enough contact hours are given to practical lesson. However, 4 representing 20% for institution B, and 2 representing 10% for institution A, said Strongly Agree and Agree respectively

The table belowshows the response to the question about the availability of the require machines and equipment at the workshop for teaching and learning practical lessons in the selected institutions.

Table10: RequiredMachines and Equipment for Teaching and Learning

Response(s)	**Institution**		**Total**	
	A	**B**	**Number**	**percentage**
Strongly Agree	0	0	0	0%
Agree	0	2	2	10%
Disagree	10	8	28	90%
Strongly Disagree	0	0	0	0%
Don‟t know	0	0	0	0%

The table above presents result to indicate that, only 2 instructors representing 10% chose „„Agree‟‟, whiles the rest 18 representing 90% choosing „„Disagree‟‟‟indicating that, the require machines and equipment are not available at the workshop.

In assessing competency of student performance there should be much interaction between instructors and students during practical lessons and this is displayed in the table below.

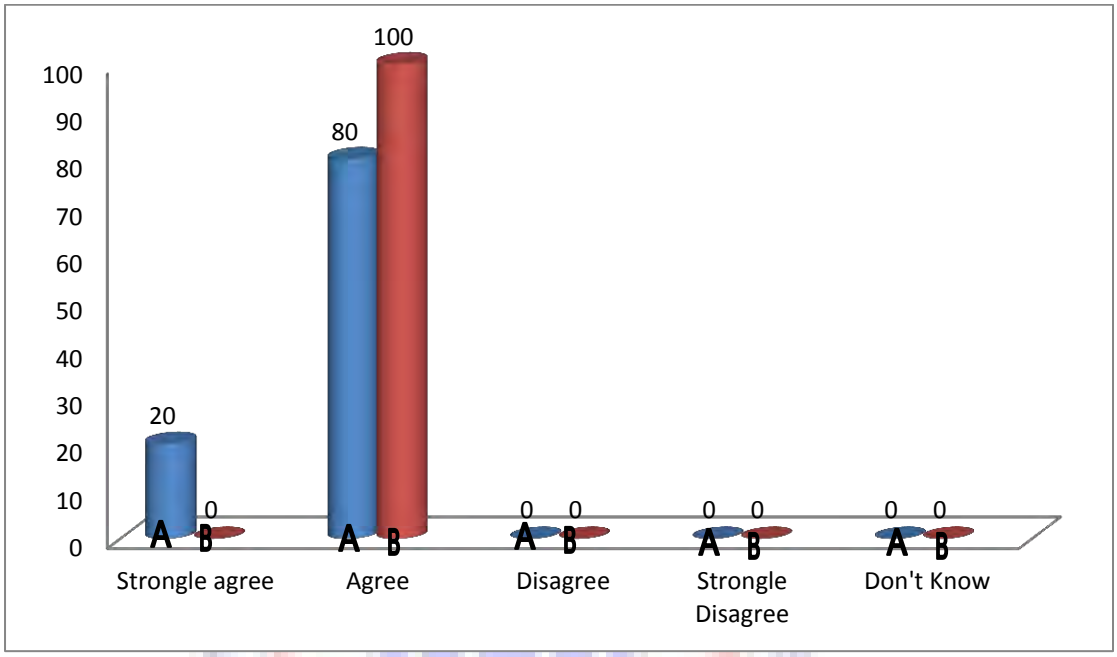

Figure5: Interaction between Instructors and Students

The figure above shows response to the interaction between instructors and students, 2 instructors representing 20% accept Strongly Agree, 8 represent 80% supported Agree for institution A, while 0% is for Strongly Agree and 10 instructors representing 100% standing for Agree for institution B.However, the majority of 18 representing 90% for both institution, Agree to have much demonstration and stimulation of working process between instructors and students during practical lessons.

The table eleven and the figure seven below, analyzed whether the ratio of the conventional lathe machines to students is as good as expected during practical lesson.

Table11: Ratio of Machine to Students in various Institutions

Response(s)	**Institution**		**Total**	**percentage**
	A	**B**	**Number**	
Strongly Agree	0	0	0	0%
Agree	2	4	6	30%
Disagree	6	6	12	60%
Strongly disagree	2	2	4	10%
Don't know	0	0	0	0%

In response to the questions above the table indicates, 2 representing 20% Agree ,6 representing 60% Disagree and 2 representing 20% strongly Disagree for institution A, whiles institution B, 4 representing 40% agree and 6 representing 60% Disagree to the good ratio of machine to students.

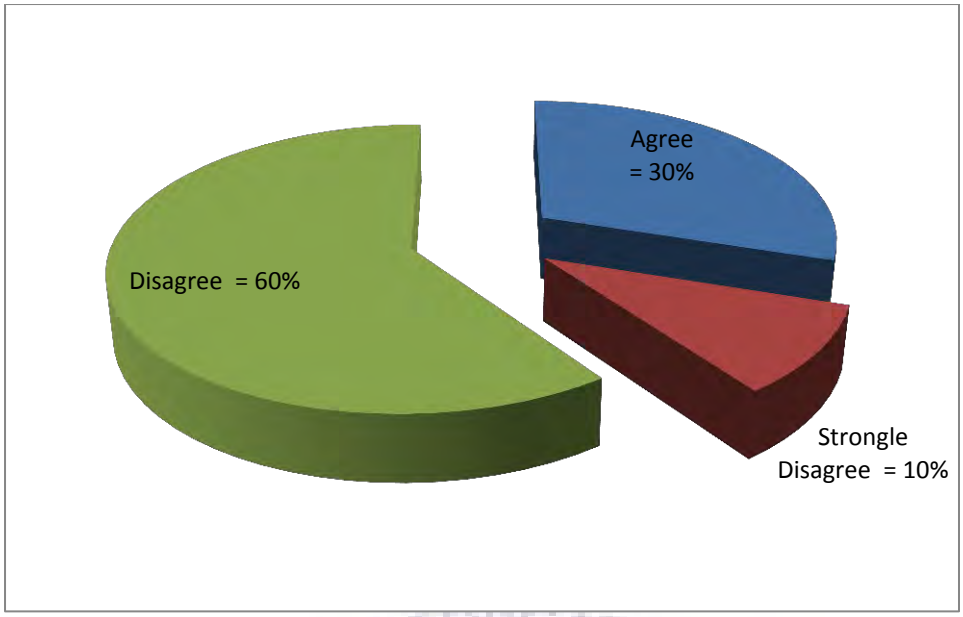

Figure6.Ratio of Machine to Students

The pie chart above figure7 shows the ratio of machine to student for both institution, 6 representing 30% accepted Agree, 12 representing 60% going in for Disagree and 2 representing 10% stands for Strongly Disagree. In effect the total 14 representing 70% are of the views that the ratio of machine to student is not good in any way for practical lesson.

The researcher wanted to find out in the table below, if there is an access to the conventional lathe machine any time at the workshop for students to operate or practice lathe turning.

Table12: Students having Access to a Lathe Machine

Response(s)	**Institution**		**Total**	**Percentage**
	A	**B**	**number**	
Strongly Agree	2	4	6	30%
Agree	6	6	12	60%
Disagree	2	0	2	10%
Strongly Disagree	0	0	0	0%
Don"t know	0	0	0	0%

In table 12 above the results shows that, 6 instructors representing 30% strongly Agree ,12 representing 60% prove to Agree and 2 representing 10% disagree to that fact .The total, 18 representing 90% for both institution accepting the fact that there are access to machines any time students wants to operate it.

To the question, whether requisite tools for teaching and learning practical lesson are readily available in the workshop, the table below illustrates the data.

Table: 13 A Requisite Tools for Teaching and Learning practical'sLessons

Response(s)	**Institution**		**Total**	**percentage**
	A	**B**	**number**	
Strongly Agree	0	0	0	0%
Agree	0	2	2	10%
Disagree	0	2	2	10%
Strongly Disagree	10	6	16	80%
Don't know	0	0	0	0%

In table 13 the outcome shows that 2 Instructors representing 20% opted for Agree, the same number as well as Disagree, and 6 representing 60% strongly Disagree for institution B, while 10 representing 100% responding Strongly disagree for institution A, testifying that requisite tools are not readily available for teaching and learning. In general the result of the number for both institutions, 18 instructors representing 90% Strongly Dissatisfy with the unavailability of requisite tools to attain competency training.

In table fourteen below shows the results when, needed skills to operate the lathe machine to the fullest are acquired before graduating to the further year, was asked.

Table14: Needed Skills Acquired Before Promotion

Response(s)	**Institution**		**Total**	**Percentage**
	A	**B**	**number**	
Strongly Agree	0	0	0	0%
Agree	4	2	6	30%
Disagree	0	4	4	20%
Strongly disagree	6	4	10	50%
Don"t know	0	0	0	0%

To find out, the result indicates, 6 instructors representing 30% said Agree, 4 representing 20% responded Disagree, together with 10 representing 50% standing for Strongly Disagree. The summation of both institution 14 representing 70% for both institution Disagree and Strongly disagree indicate that students do not readily acquire the needed skills before being promoted.

Both table fifteen and the figure eight were used to analyze whether there is more emphasis on acquiring practical skills than the theoretical knowledge.

Table15. Much Emphasis on Practical Lessons

Response(s)	Institution		Total	Percentage
	A	B	Number	
Strongly Agree	0	4	4	20%
Agree	8	6	14	70%
Disagree	2	0	2	10%
Strongly Disagree	0	0	0	0%
Don't know	0	0	0	0%

The table 15 above indicates that, 8 instructors representing 80% Agree and 2 represent 20% Disagree for institution A, whiles 6 representing 60% Agree and 4 representing 40% Strongly Agree for institution B. The analysis for both institutions indicates in the figure below as much emphasis are laid on practical lessons.

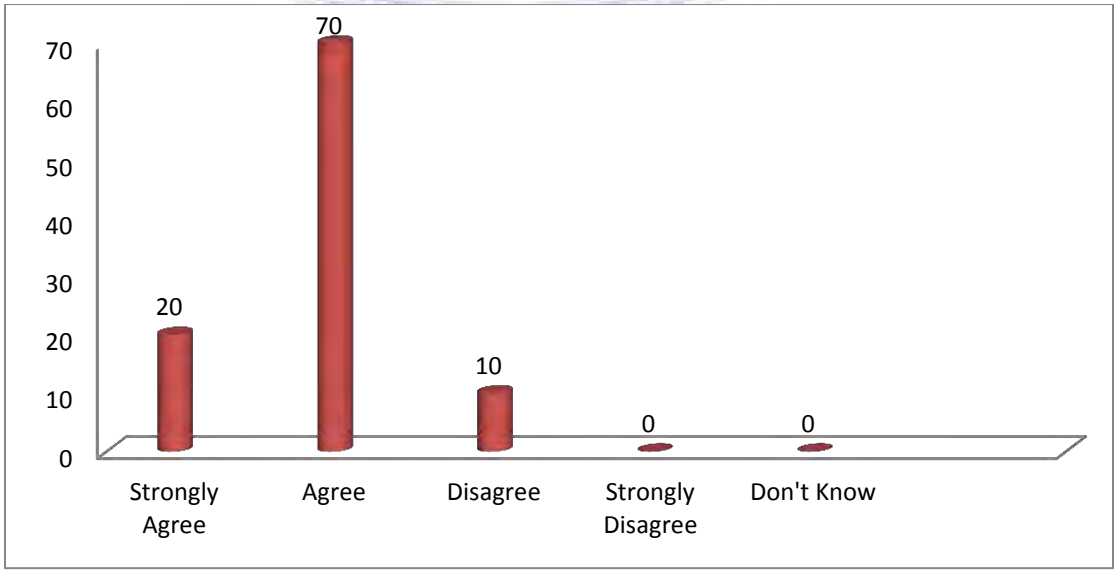

Figure 7.Emphasis on Acquiring Practical Skills

In the figure 8 above, 4 representing 20% Strongly Agree, 14 representing 70% Agree and only 2 representing 10% disagree. In effect 18 instructors representing 90% of both institutions supported the fact that emphasis in the acquiring practical skills is highly observed.

The following table and figure below, highlights the individual response as to the workshop being well organized for practical lessons and training.

Table16: Workshop Well Organized for Practical Lessons

Response(s)	**Institution**		**Total**	**Percentage**
	A	**B**	**number**	
Strongly Agree	0	4	4	20%
Agree	0	0	0	0%
Disagree	0	0	0	0%
Strongly Disagree	10	6	16	80%
Don't know	0	0	0	0%

The result above in table 16 shows that, 4 instructors representing 40% for institution B chose Strongly Agree. 10 representing 100% from institution A and 6 representing 60% from institution B are of the same view to strongly Disagree to the workshop well organized for practical lessons and training. Both institutions 16 representing 80% Disagree to the situation leaving the 4 representing 20% to Agree.

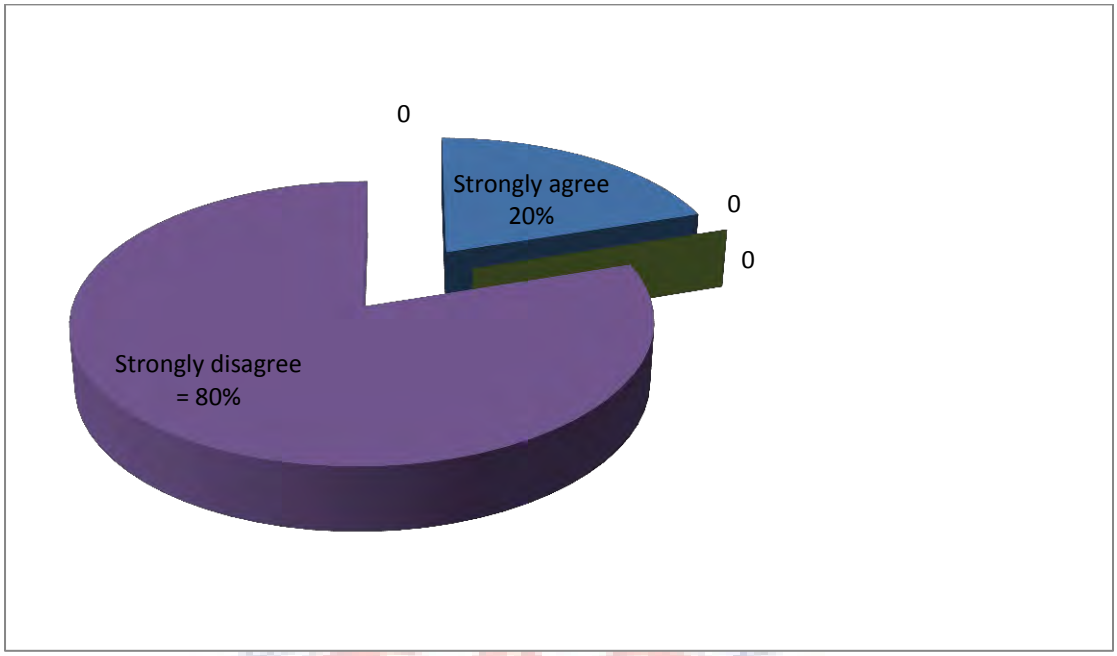

Figure 8: Workshop well Organized for Practical Lesson

The figure above shows that most respondents for both institution. 16 instructors representing 80% challenging to Strongly Disagree to the fact that workshop is well organized for practical lesson and training, whiles 4 representing 20% accepted Strongly Agree.

In question number eleven, the research was trying to find out from the instructors the meaning and the understanding of strategy and the average outcome was;

- Planning a continuous practice to achieve a goal
- Skills of planning in advance for practical lessons
- Planning of skills and allocation of more credit hours to practical lesson
- High level planning to achieve one or more goals

Item twelve of the questionnaire asked instructors to provide the strategies used in teaching practical lesson on conventional lathe machine. About 80% contributed using the following strategies.

- Observation and continuous practice
- Competency based approach that is after safety precaution, know all lathe parts and their function then introduce students to the machine operation.
- Apprenticeship Approach especially during students attachment period
- Ensuring that tutorial and practical go hand in hand
- Assign students with work piece to work on
- Demonstrate how to use the machine

The understandings of the term competency by the instructors as the item thirteen reveals are

- Having the capacity to complete the task or the basic ability to do something.
- The capacity of an individual to act adequately both with process and product in the relevant professional setting.
- One‟s ability to do what he has been taught or assign to do
- One‟s ability to achieve a goal or perform a task assign him

All Instructors responded positively that, the following competencies can be acquired on the conventional lathe machine in item fourteen of the questionnaire and are stated below as

- Turning, taper turning, boring

- Operating skill, accuracy in working, precision in working
- Facing of component
- Thread cutting
- Drilling blind hole
- Setting work in 4-jaw chuck

The item fifteen demanding suggestion ways of improving the teaching of practical lesson, instructors were of common consent that

- More practical equipment is needed
- More students contact hours
- Small class size
- Provision of suitable and adequate practical materials
- Increase practical hours
- Regular training of instructors
- Impartation of skill training should be mounted for instructors or lectures
- There should be a planned practical training
- Competency based approach should employed
- Regular assessment on practical work or assignment
- Monitoring students during practical lessons
- Students who refuse or fail to attend practical lesson must sanctioned by a certain measures.

The opinion of instructors, about 90% ascertained in item sixteen as to factors affecting poor performance of (HND) student in the use of the lathe machine. The suggestions are summarized as following

- Time allotted is not enough
- Limited machine
- Larger number of students to lecture ratio
- Limited practical hours
- Negative attitude of students toward practical lessons
- Insufficient tools and equipment
- Management reluctance to invest into training instructors, lectures or workshop attendants in professional practical skills.
- Less credit hours
- Lack of monitoring students practical lesson
- Inadequate practical lessons
- Students reluctant in taking practical hours and lesson serious.

CHARTER FIVE: DISCUSSION OF RESULTS

5.0 Introduction

This chapter discusses the response of data that has been collected, expressed, and analyzed in tables, pie charts, bar charts and percentages by the researcher. It deals with findings and discussion of result of data analyses for students and instructors as well as the summaries of the respective discussions.

5.1 Discussion of Findings of Responses to Questionnaire for Students

5.1.1 Discussion of Finding on Background

All students (100%) who responded to the questionnaire from both institutions are from the Mechanical Department and their Area of specialization is Mechanical Engineering. With regards to department and specialization the responses indicates the general overview of the subject matter for the particular issue of the research work.

The results shows the period of using workshop of special fields, majority 82.5% appear to be in year three to year one while the remaining (17.5%) have spent less than one year in the institution. Looking at the years of the students it could be deduced that student should have had experience in so many practical lessons of the lathe machine competency but they seems to have very little practical lessons and the 17.5% appear not have any practical lesson at all since they may be Part-Time students or Pre-HND students.

Almost two third (57.5%) attends practical lesson once a week, (5%) more than three times a week, (2.5%) twice a week and 35% not at all. This reveals that the practical lesson within the week is very small and very alarming due to the

limited period allocated for the practical lesson on the time table. Meanwhile, more practical period (6- 10 hours) within a week tends to help the students to acquire more competency skill as compare to the (35%) that appear not to have any practical lesson within the week and that could be dangerous if they happen to be in the year two or three. The few (5%) from institution B and (2.5%) institution A, responded, more than three times a week and twice a week respectively seems to be exceptional student who manage to use their own periods for an additional practical lessons within the week.

About one third (30%) spend more than one hour per a practical lesson, and almost (57.5%) nearly reported either one hour, (30) minutes or (20) twenty minutes during a practical lesson. The result (57.5%) shows that the hours uses for a practical lesson seems not to be enough due to either theoretical period encroaching practical‟s lesson hours, even though the number of practical period within the week is limited, practical hours should not be less than three hours. This may adversely affect student‟s performance in the practical lesson due to the fact that assignment and assessment of practical lessons covers more hours and helps students to improve upon their competency performance. However numbers of periods within the week suppose to be increased in order to affect the number of hours per a lesson.

The large number, three out of four (75%) responding „No‟ to having extra time for practical lesson suggest that there may be a problem of instructors allowing students to occupy the machines in their own leisure time for practical lessons. Also students may see the practical lessons as disturbance and abstract not relating to real life situations combining with theoretical subject which demand a

sitting examination for an assessment into a higher class and would not spend the rest of time on it. The one out of five (20%), appear to be serious student who sometime manage to avail themselves at the machine shop for more experience during their leisure time. Whiles the remaining 5%, being outstanding student who are being allowed to do practical lessons or to help instructors at the machine shop.

The majority (52.5%), students tend to be more satisfied with the workshop being well equipped with conventional lathe machine adequate for practical training. This shows that average equipment for practical training are being accepted by this faction of students who appear to have the desire to learn the practical lesson as compare to the (47%), their counterpart who responded „No" which could have various reasons leading to that effect. However, the responses "Yes" 30 out of 42 for institution B, far outweigh the counterpart institution A, which also responded "No" 28 out of 38. Meaning institution B, equipment and machines for practical training are well organized whiles institution A, seems to have a peculiar problem pertaining to the workshop equipment and machine being well organized for practical training.

In general different figures were used to represent the ratio of students to a machine in various institutions due to the vast margin of response to the item for both institution and were considered 100% for each institution. According to figure 2, most of respondent"s institution A, (65%) believes to have more than twenty (20) students to a machine. The large number of student responding to the greater ratios of student to a machine may indicates the Lukewarn attitude of student towards practical lesson in institution A, or have either greater number of

student in a class or less number of machines at the workshop. This may also be negligence or lack of technical know-how on the part of the institutional management to provide adequate machines and will end up collapsing student performance in the practical training. About one third (35%) tends to have less number of students to a machine which will help them improve their practical skills. Average (65%), for institution B in finger 3, appear to accept five 5 student to a machine. However this could be a good practice on the part of the institution or the instructors. Since less number of students to a machine allows the students practice more to improve machining skills and competencies on the lathe turning. The remaining (35%) indicating more number of students to a machine seems to have less privilege in operating the lathe machine during practical period and probably would not be serious student among them in getting access to the machine.

The pie chart figure 3, majority of students (70%) reports to nearly agree to the fact that practical lessons are sometimes well organized for both institutions. This large number responding to the sometime nature are difficulties in the workshop organization for practical lesson due to either large ratio of students to a machine, Lack of sufficient machines or equipment although instructors or lectures try their possible best to organized the workshop well for practical lessons. The researcher views this as a good practice so far as students practical lesson are of more importance to them. The average, one out of five, (22.5%) shows the outstanding students who responded „Yes" to the well organized workshop for practical lesson and the meager student (7.5%) said „No", seems to present the truant or lazy ones who may escape practical lessons.

5.1.2 Discussion of Findings on Competencies in Table 6

Item eleven: The majority (55%) of the students appears to "Strongly Agree" and "Agree" to check lubrication, belt tension and switches before starting the lathe machine. This indicates that most students observe maintenance being taught by instructors, but (42%) "Disagree" and "Strongly Disagree" to the fact, which more emphasis must be stressed on effort of teaching students such preventive maintenance in order to obtain long life of the machine as well as the safety of the operator.

Item twelve: Almost nine out of ten (87.5%) of students tends to "Strongly Agree" and "Agree" with the lathe machine that can perform almost all operation than any other mechanical machine. This shows that students were theoretically informed about the multi-operational function of the lathe but probably has not been introduced to many of them by the instructors, whiles the (12%) happen to disagree and could be the very few ones who normally swerve lectures or practical lessons.

Item Thirteen: The operation of the lathe machine requires more alertness than any other machine was supported by most (80%) of students who believe to "Strongly Agree" and "Agree". The huge number of student responding seems to be aware of how dangerous the lathe machines are and would observe the safety precautions as due it during practical lesson. However, much acknowledgement would be given to lectures or instructors to stress on all dangers and safety aspect of the lathe machine. Out of five (20%) tends to "disagree and these could be student in the year one or fresher"s who might not have any or much idea about lathe machine safety.

Item fourteen: To further discuss the findings to the objective part of the questionnaire nearly one third (40%) appear to "Strongly Agree" and "Agree" to the fact that chucks are the only means of holding component in the lathe machine. Meanwhile other methods of work holding are available which almost all students should know immediately being introduced to the lathe machine during practical lesson. As compared to the counterpart majority (60%) "Disagree" and "Strongly Disagree" disputing the fact, indicating the seriousness on the part of these students who believe would be regular in attending practical lesson or belong to the year three, to boost their performance in practical skills as well as competencies in lathe machining.

Item fifteen: The data reveals that setting work in the three-jaw chuck is more difficult than four-jaw chuck majority of student (85%) "Disagree" and "Strongly Disagree" showing that setting work in three-jaw chuck is easier as compare to the four-jaw. Most students often appear to use three-jaw chuck with low competently in lathe machine work holding, whiles (15%) "Strongly Agree" and Agree" seems to have not attended any practical lesson or have not heard any theory about their advantages and disadvantages.

Item sixteen: The practicality of the four-jaw chuck which gives much precision in setting work on the lathe was supported by most (82%) of students who believe that fact. The findings reports that either instructors prioritize much lesson on the usage of four-jaw chuck or student have been coached theoretically about the advantage of the four-jaw chuck as compared to the minority (17.5%) of student that seems to have "Disagree" and "Strongly Disagree" to that fact and

may have problem with practical lessons on the lathe machine work holding, even if might have not heard of any theory about holding work with the four-jaw chuck.

Item seventeen: The truing operation is done on the lathe machine mostly with the compound slide was ascertained, nearly three out of four (65%) of student tends to “Strongly Agree” and “Agree” to the item. The militating factor was that turning operation is mostly done with saddle not the compound slide and shows that either instructors do not thorough explain the functions of the lather parts or most students not critically observe the functions of the lathe parts during practical lessons. The remaining (35%) of student “Disagree” and “Strongly Agree” to the question indicating that the responded student believe to have known the actual parts of the lathe that mostly perform turning operation and could be the exceptional students.

Item eighteen**:** The responses analyzed the question, the cross slide is mostly use when performing facing of a component, average three out of four (75%) of students appear to “Strongly Agree” and “Agree”. The researcher appreciate the fact that instructors made students understand the competency of facing work piece in the lathe machine by the function of the cross slide, whiles (25%) of students seems to “Disagree” and “Strongly Disagree” tends to have been lacking practical knowledge of facing and instructors should improve upon impacting common lathe competency skills to them.

Item nineteen: Result in general on the question the cross slide and the compound slide more in the same direction has been disputed by majority (72.5%) of student that “Disagree” and “Strongly Disagree”. The response presents the practical ideas of the student to assimilate the different direction of the cross slide

and the compound slide due to either the effort of the instructor on the practical lesson or the lecture notes on the functions of part of the conventional lathe machine.

Item twenty**:** states, mandrels are used to enable bored work piece to be located between centers on the lathe machine. The majority respondents (85%) "Strongly Agree" and "Agree" which the researcher sees it as good attempt by the students to acquire that skills. This means that student performances were based on either theoretical or observation but rather should involve in the practical activities to practice and feel the function of a mandrel. The respondents (5%) "Disagree to use of mandrel in the lathe, whiles (10%) have not heard about the use of mandrel.

The response clearly indicates that more than half (62.5%) of student "Disagree" and "Strongly Disagree" and were of the view that drilling and boring are different operation. Experience reveal that students attend practical lessons once a week and even have less hours per a lesson which may affect their skills performance to differentiate between drilling and boring. However, about one third (32.5%) of student accepted the wrong facts about drilling and boring being the same which could be very bad ideas in competencies of lathe machine operation, while (5%) were novice about drilling and boring in the lathe machine.

According to respondents, drilling, and boring operations all require proper use of the tail stock measurement, almost two third (57.5%) of students, "Strongly Agree" and "Agree", showing that instructors try to explain the techniques involving drilling and boring competencies especially when using the tail stock on the lathe machine, and to demonstrate to students the importance of graduations on

the tail stock sleeve. About one third (37.5%) of student "Disagree" and "Strongly Disagree" indicating that students have not acquire any skills in terms of drilling and boring on that lathe machine and even most students would not border to find out whether there are graduation on the sleeve of the tail stock, whiles the (5%) could not come near any fact about measuring depth with tail stock when drilling or boring in the lathe machine.

The percentage of students" majority (75%) "Disagree" and Strongly Disagree" accepting the fact of not having any idea about checking sizes of drilled holes with reamers. In fact, the number of students objecting this operation could be very discouraging due to the fact that reamers are being use for finishing precision holes that had been drilled or bored for a particular purpose. However, either no reamers available or could suggest that almost all tools that would be used in any of the lathe competency operation were not displayed, explained and demonstrated to student by instructor to have fair ideas about functions and purpose of the tools and equipment use in the lathe operations. Another observation could be that students do not attach themselves to the industries with workshops functioning with lathe machine operations. The one out of four (25%) students, report to know about checking sizes of drilled holes with reamers and these student would appear to be serious with their practical lessons and may pay attention to instructors during demonstration or lecture on lathe operation.

In responding to whether Taps and Dies can be used on the lathe machine to cut threads almost half (52.5%) of students "Disagree" and "Strongly Disagree" indicates that greater number of students seems to have problem with the practical lessons and did not have an idea about Taps and Dies which could be used to start

a thread or cut full thread if work is held in the lathe machines, whiles the students closely (45%) believe to “Strongly Agree” and “Agree” to the use of taps and dieses in the lathe machine. this shows that instructors try to elaborate the use of some hand tools that are to be attached in lathe operations most especially files, scrapers, thread chasers taps and dieses sand papers and many more.

The parting-off, undercut, knurling are special operation that requires special operation that requires special tools on the lathe was found out from the respondents, almost all (95%) of student “Strongly Agree” and “Agree” which reports low effective the lectures could impact these lathe machining competencies that requires special tools to the students either. Another factors leading to this may be practical lesson sometimes well organized that operation. The remaining students (2.5%) and another (2.5%) strongly disagree and don‟t know about that fact respect only.

Interestingly, when respondents were asked about instructors allowing students to operate the lathe machine at their leisure time, almost (57.5%) of students “Disagree” and “Strongly Disagree which indicates that instructors prevent students from operating the machine. The lack of free access to machine and equipment for students is quite disturbing, “Skill development which is an integral part of work base Learning programs for practical‟s can hardly take place when students are not having free access to machine and equipment.‟‟ However, instructors are sometimes reluctant to grant free access to machines for fear of damage due to improper usage, accidents and possibly reduce the life of machine if less monitored. These fears notwithstanding some measures could be taken by insuring the machines and the equipments.

The counterpart (42.5%) “Strongly Agree” and “Agree” reports students who are exceptional and take practical as priority and practice whatever assignment given immediately after demonstration by the instructor.

On gathering students responses as stated by majority of students (85%) „„Disagree“““ and „„Strongly Disagree“““ to the fact that students operate the lathe machines at their leisure time. There is a saying that, practice make man perfect, therefore, the percentage of students responding to that effect hardly operate the lathe machine at their own leisure time and could be detrimental to their lathe turning competencies. This may be due to prevention on behalf of instructors due to fear of damage of machine, it could also be noted that machine would be made available by instructor but negligence, lukewarm attitude, complacency attitude and over confidence of students leading to this effect. Only (15%) of student, “Strongly Agree” and Agree” to operate machine at their leisure time due to either their regularity at practical lesson or seriousness in operating lathe machines.

On the existence of precision measuring instruments, gauges, instrument for work setting in the lathe machine were inquired from the students whether these instruments are being used on a component that needed to be machined in the lathe machine and the results show that

- Precision measuring instruments for example micrometer, vernier caliper majority (100%) “Strongly Agree” and “Agree”
- Gauges, for example plug gauges, snap gauges outside caliper and inside caliper, majority (90%) “Strongly Agree” and “Agree”.
- Work setting instruments for example Dial Test indicator (DTI) and scribing block majority (87.5%) “Strongly Agree” and “Agree”.

The response in the various item, as indicated above, majority believe that a completed machined component would have gone through the process of setting work with Dial Test indicator (DTI), measuring work with the precision measuring instrument and checking work with gauges.

These reports given by almost all students seems to have either be a theoretical idea about the stated instruments which have been illustrated by lectures or might have observe instructors demonstration lessons of their uses during practical lesson otherwise student should have a firsthand feel of using some of these instruments as practical lesson in order to rich and augment their knowledge in measuring competency skills.

5.2 Summary of the Findings for Students

Observations made during the research period were very useful because it helped the researcher to experience what happen at the work shop during practical lesson. It was found in this study that students attend practical lesson once a week and even, about one third of students do not have it at all. The study also revealed that the majority of student spent average of one hour for a practical lesson. Also student have no extra time or leisure time for practical lessons.

Besides, the study also revealed that average number of students appreciated the adequacy of conventional lathe machine at the work shop and the workshop sometimes well organized for practical lessons. Although, majority of students reported “more than twenty students to a machine” which is very high ratio of students to a machine during practical lesson.

The study further revealed that lathe machine are thoroughly checked and lubricated before starting it. However students are aware that the lathe machine can perform almost all operation than any other mechanical machine and requires more alertness than any other machines.

It was revealed that (60%) of the students could have an idea that, chuck is not the only work holding service in the lathe machine as well as setting work with the three jaw chuck being easier than four-jaw chuck. The study also indicates that (82%) of students accepted the fact that work set in the four-jaw chuck is more precise than three jaw chuck.

It is evident through this research that most students lack the idea that turning operation is mostly done on the machine with saddle but rather not the compound slide. Although majority of students prove to agree that facing is done with cross slide meanwhile, students accepted the fact that cross slide and compound slide do not move in the same direction.

The study indicated that the use of mandrels to enable bored component to be located between centers in the lathe machine is known to students. However, students could differentiate between drilling and boring as separate lathe operation and requires proper use of tail stock measurements.

There were no significance attached to checking sizes of drilled holes with reamers and students virtually disagree that taps and dieses can be used on the lathe machine to cut thread. Almost all students could recognize that parting off, undercut and knurling requires special tools.

Most of the students reported that instructors do not normally allow them to operate the lathe machine during their free periods whiles majority of student do

not avail themselves to operate the lathe machine at their leisure time. However, students have realized that before a machined component would be ready for use, working setting instruments will be used, Precision measuring instruct as well as gauges are used.

5.3 Discussion of Findings of Response to Questionnaire for Instructors

With regards to the department and area of specialization all lectures or instructors from both institutions (100%) believe to have belonged to the Mechanical Department and area of specialization is Mechanical Engineering. The result shows that respondents have much experience in their field to provide undisputable facts to find solution to the researcher‟s problem.

There was an equal response between "more than four years" ago and "three years ago" with the rest scoring zero percent to the question how long have you been using the workshop related to your special field of study. This indicates that instructors tends to have much experience to test or evaluate the students at the ends of a practical lesson and the researcher perceive this as a good practice so for as teaching and learning of practical skills on the lathe machine is concerned which would eventually assist students to acquire effective competency skills in lathe operation.

The results for the year group of practical lesson (40%) of instructors appear to teach the year one whiles majority (60%) teach the year three students. The response indicates a tactical, practical, strategically and competency approach in planning practical lessons by the department as year one student may need practical instructors to acquire the basic lathe operation competencies in order to

usher them into an attachment field. Also the majority (60%) instructors assign to the year three would enable students to polish and enhances the understanding of competency skills prior to enter into the industries for an employment. However, since practical lesson demands more periods for gaining an experience, the year two suppose to have enough attachment periods for quality improvement in the lathe operational skills before graduated to the year three.

The analyses of respondents (60%) "Strongly Agree" and (40%) "Agree" to the assurance as parts and functions of the conventional lather are well introduced to student before operating the machine. The response (100%) of instructors in affirmative presents how instructors do their possible best in the introduction of the lathe machine parts and their functions since most of the students would be novice to the lathe machine and might have come from various "Senior High Schools rather than Senior High technical or technical schools. Although lack of sufficient machine affect proper ratio of students to a machine and malfunction of most lathe parts for an advance demonstration to students, before starting operating the lathe may also seems to affect student performance or either delay the rate of grasping the operating competency skills.

On the contact hours given to practical lesson majority of instructors (70%) disputed the fact that enough hour is given to practical lesson while the remaining (30%) believe to have supported the face the enough time is given for practical lesson. The average, more than two third of instructors appears to strongly disagree to the enough time, is very alarming because practical‟s needs enough time for instruction, demonstration and practice in order to acquire the requisite skills in the lathe machine operation. Another militating factor is not only contact

hours but also the frequency of practical period on the time table must be enough for enough contact hours. However, instructors should try to advice student to devote most of their time for practical periods and avail themselves for practical lessons. The instructors (30%) on the side of enough contact house may be due to their smartness in organizing the practical lesson and managing the student ratio to a machine for a proper practical lesson to be achieved. This may also depends on a fraction of good student with average practical knowledge and will not waste much time in their practical demonstration and instruction.

The response emanating from whether the required machines and equipment for teaching and learning practical lesson are available at the workshop, the majority (90%) of instructors were not in favors of that fact. the greater number, almost all instructors not in support of require machine and equipment is very disastrous on the part of the department as well as the institution. These could be less number of machines, not the require type of machines, faulty machines that lack maintenance. Insufficient tools and equipment, inappropriate tools and equipment and malfunction of equipment may go a long way to affect the practical lesson of the student and eventually detriment the competency of student in lathe machine operation. The remaining (10%) of instructors seem to have a particular methods of teaching practical lesson which would appear not to demand much machines or equipment for the preparation of special lathe operation.

As to the interaction between the instructors and the students during practical lesson the majority of instructors (90%) believe to have much interaction with students. Infact, this tends to be a good practice on behalf of the instructors, although there would be problems such as greater ratio of student to a machine,

insufficient tools and equipment for well organize practical lessons or less contact hours for practical lessons. Instructors seem to have done yeoman‟s job to raise student for middle man power level skill in lathe machine operation and the needed to be congratulated and acknowledged. The counterpart (10%) disagree to have much interaction with students may be due to either having problem with some student behavior or not well acquaint with the use of most of the machines and the equipment for demonstration to students.

On summarizing instructors‟ views on whether the ratio of conventional lathe machine to students is good, the pie chart figure 7, in effect indicates (60%) of instructors „„Disagree‟‟ and „„Strongly Disagree‟‟ on the support of good ratio of machine to students and may describe it as very bad in any way for practical lesson. Meanwhile, the majority of instructors may see this act as nuisance which may cause harm or offense to students learning skills work. Students have already confirmed it and tend to have adversely affect student performance in lathe operational skills. However either large class intake, insufficient machines and equipment, less number of practical instructors, workshop area too small to accommodate enough machines or absence of technical experts among institutional management in order to take decision and solve critical problems concerning competency skills training. The remaining (30%) instructors appears to Agree to the ratio of machines to the students as good one and may either be instructors handling sizable number of class and could manage and appreciate the number of students assign to a the machine during practical lessons and hope to active trading and learning goals so far as student competency skill are concerned.

The result to find out if there is an access to the conventional lathe machine anytime at the workshop shows that, majority of instructors (90%) for both institution equally accepted the fact that students have access to operate the lathe machine any time they feel. In this response instructors could be acknowledged and appreciated for hard working although despite inconveniences as to large ratio of students to a machine and others, instructors endeavor to make machines available to students on their leisure time to substitute lost time during large number of student ratio to a machine. Nevertheless, the researcher had found out that majority of students, even though have been given the chance to operate machine on their leisure time, they appear not having time or creating free time for themselves to operate the lathe machines and may concentrate on theoretical subjects or otherwise and these could not be successful to student in assessing competency of their performance in lathe machining operation. To add, practice makes students perfect and the more students practice the much they acquire competency skill in lathe operation. The (10%) of instructors disagree to the availability of machine at the workshop for students due to either their schedules of practical lesson or relation to admit student on their leisure time at the workshop.

On the instructor‟s awareness whether requisite tools for teaching and learning practical‟s are readily available in the workshop, (90%) of instructors „„Disagree‟‟‟and „„Strongly Disagree‟‟‟. The majority of instructors believe to have rejected the statement indicating that there are no requisite tools as such. The chunk number of instructors responding to this matter is very disturbing in a sense that learning practical‟s without requisite tools does not make it viable although

instructors could do their possible best to organize the workshop for practical lessons but will still find it very difficult. The cause may either be large ratio of students to a machine or to an instructor which researcher had already reviewed in the aspect of workshop organization and this dissatisfaction with the unavailability of requisite tools may affect student attainment of competency training skills.

The researcher was trying to know about whether students acquire the needed skills to operate the lathe machine to the fullest before graduating to the year ahead and most (70%) of instructors „„Disagree"" and „„Strongly Disagree"" indicating that students seems to have not readily acquire the needed skills before promoted. This response could be another worrying issue which instructors would tend to ponder over if due to the fact that student will either capitalize on it and will not take practical lesson serious or instructors appear to also slack in their practical lesson activities and being disadvantageous to student performance in machine operation and most specifically lathe operation competency. However, many factors may accrue to this fact, either lack of requisite tools, insufficient machine or large ratio of students to an instructor. Therefore, Institutional authorities should take this as major factors to repeat students if anyone fails in practical lesson and students will tend to change their behavior and intensify their effort in practical lesson activities.

According to respondents majority (90%) of instructors „„Strongly Agree"" and „„Agree"" to the fact that much emphasis is laid on acquiring practical skill than the theory on the part of instructors. This indicates that instructors believe to have use demonstration method in their practical lesson that is displaying tools and equipments as well as engineering component for detail practical lesson to ease

assimilation of competency skills. Also instructors appear to spend much time to ensure practical assignment are assessed and commented for correction showing that practical skill lesson is highly observed. The remaining (10%) of instructors „„Disagree"" could tend to have difficulties with the method adopted in teaching the practical lessons or might have spent much time on other theoretical subjects.

The results in the pie chart figure 8, for whether the workshop is well organized for practical lessons and training shows that about four out of five (80%) of instructors „„Strongly Disagree"" and challenge to the fact that, the workshop is not well organized for practical lessons. The majority of instructors coming out with distressing fact could be very damaging to student"s performance in competency skill. Meanwhile a well organized workshop could cause enhancement to student practical skill learning which has become a burden to practical instructors. This may be due to improper arrangement of workshop machines or breakdown of workshop machines, electrical problems to the machines for example, failure of switches, fuses and faulty electrical wires together with ventilation and illumination, all could contribute to un-conducive workshop for practical lessons. Although, instructors seem to have overlook all these deficiency and manage to organize the workshop for practical lesson. However, these should be rectified for a well organized workshop for practical lessons in order to accomplish a competency practical skills training in lathe machine operation. The counter part one out of five (20%) of instructors believe to support the idea of the workshop being well organized depending on either how they organize the practical lesson and accepting the outcome of the lessons.

The instructors were of common consent of the meaning of strategy, as high level planning, planning a continuous practice, skills of planning in advance for practical lesson and planning of skills and allocation of more credit hours to practical lesson, all to achieve a goal. However, strategy is „„carefully devised plan“““of action to achieve a goal or the act of developing or carrying such a plan. This carefully devised plan could be a systematic approach which none of the instructors had mentioned in their meaning. Lathe machine operation need a systematic planning as what comes first and what follows to the last. Meanwhile, instructors believe to devise a plan according to the available machines, tools, and equipments, time allocation and the behavior of students to teach the practical lessons.

In the contribution made by instructors towards the strategies use in teaching conventional lathe machine practical lessons, most instructors agree to the following as, observation and continues practice, Apprenticeship Approach, ensuring that tutorials and practical go hand in hand, assign students with a work piece to be machined, demonstrate how to use the lathe machine and competency approach by which students are being taught that; after safety precaution follow by knowing all parts of the machine and their function and finally introduce students to the machine operation. Instructors seem to be abreast with all sort of individual strategies but rather should have a „*common devised strategy'* in all institution for teaching practical skills lessons for the various machines but most peculiarly the operation of the lathe machine in order for students to acquire the full competency skills.

This may be due to different levels and background of students admitted, different types of lathe machine in various institution, different materials and material sizes, and varying methods and strategies used by individual instructors which tends to affect the common goal targeting to achieve.

The responses to the understanding of competency by instructors are summarized and revealed as; Having the capacity to complete a task , having the requisite skills needed on a particular job, the capacity of an individual to act adequately both with processes and product in the relevant professional setting, one"s ability to do what has been taught or assigned to do and one"s ability to achieve a goal or perform an assigned task. Instructors appear to have fair ideas about competency which could be concluded as an ability to do something, especially measured against a standard. More so, according to Hemisphere project (Assessment In Competency Based Education), competency based skills training is built on the philosophy that ‚almost all learners can learn equally well if they receive the kind of instructors they need" To make this work instructors should have the require significant changes in the development of a new and systematic emphasis on the principle of approach and delivery of training guide that is task to be taught, learners opportunity to develop actual development of competence, basis for assessing achievement and students progress in attainment of special completeness. However, lack of these competency approach and principles tends to diminish students competency skills in the lathe operation.

All instructors responded positively as to the competencies that can be acquired on the lathe machine as turning, Boring, facing of component, taper turning, Thread cutting, Drilling, Setting work with 4-jaw chuck,accuracy in

working and precision in working. Although instructors have raised concern about the various lathe competencies meanwhile, other competencies could appear to be more relevant so far as lathe competency is considered and that can be turning between centers which involves complicated accessories and interesting mechanism together with method of changing work holding accessories to the spindle-nose of the lathe machine. However, there should be a defined lathe machining competencies arrange in a stimulated and systematic order of knowledge skills experience for students to acquire the needed competency skills in lathe operation.

On suggesting ways of improving the teaching of practical lesson, the instructor‟s views on how the study can be improved are as follows

1. Adequate practical equipments is needed.
2. Practical lesson hours must be increased as well as students contact hours.
3. Small class size for practical lesson.
4. Provision of suitable and adequate practical materials.
5. Instructors should have regular skills training impartation.
6. There should be a planned practical training lessens.
7. Regular monitoring and assessment of student practical work or assignment.
8. Students who fail practical lessons should be sanctioned.

The suggestions made by the instructors and summarized above indicates that there seem to be problems confronting various institutions, individual instructors and students as a whole which need to be rectified in order to achieve the competency skills in the lathe machine operation. Most of the researchers‟ observation and discussion tends to have been revealed in the instructor‟s suggestions that will be carried forward for recommendation.

In the last item of instructors‟ response, the researcher seeks the opinion of instructors to ascertain the factors affecting poor performance of (HND) students in the use of the lathe machine. The majority of instructors suggestions are summarized and listed below

1. Time allocated for practical lesson is not enough.
2. Inadequate of lathe machines.
3. Large ratio of students to a lecture.
4. Insufficient tools and equipment
5. Lack of practical instructors, lectures or workshop attendants.
6. Lack of monitoring students practical lesson.
7. Students negative attitude and reluctance of not taking practical hours and lessons serious.

The research was trying to find out the factors militating the poor performance of (HND) students in operating the lathe machine, meanwhile, questions posed and answered by students and instructors could reveal some findings from the response which seem to almost reflect the responses by the instructor‟s opinion to the problem of the study. These findings could be considered as systematic, critical and exhaustive investigation into finding the solution to assessing competencies of students‟ performance in conventional lathe machining at the (HND level).

5.4 Summary of Findings for Instructors

The study has made known that about fifty percent of instructors have taught in the workshop for less than three years and have low workshop experience. It was also found that the second year students have less or no practical period and besides, instructors surely explain the lathe machine parts and their function before students commence to operate the machine. Meanwhile contact hours for practical lesson are very small.

More so the study uncover that the required machines and equipment for practical lesson are not available at the workshop but there were much interaction between instructors and students during practical lessons. Besides students ratio to lathe machine is very high, meanwhile majority of instructor believe that student have access to operate the few lathe machines available in their leisure time.

The study further disclose that there seems the requisite tool for practical less are unavailable in the institutions, therefore student do not normally acquire the needed lathe operating skill before graduating progressively. To add, instructors believe that, much emphasis is laid on practical skill. But the workshop appears not well organized for practical lessons.

Instructors tend to understand the meaning of strategy but seems to have left out the "Carefully device plan" which critically explain the systematic approach to achieve a goal. However, the study show that individual instructors have their own and different strategies in teaching practical lesson. It was also bring to light that instructors appear to understand competency in a common consent and could list some competencies that can be achieved in the lathe operation.

The findings reveal the inadequate practical equipment, practical lesson hours, large class size and inadequate materials which affect practical lessons. Also involvement of training instructors in planning practical lesson, regular monitoring and assessment of students practical lesson would enhance practical skill competency.

Respondents in the study indicate that factors affecting poor performance were, less time allocated for practical lesson, (inadequate machines, tools and equipment), large students ratio to a lecture, lack of training instructors, lectures or workshop attendants, lack of monitoring student practical lesson, and undesirable attitude of students towards practical lesson.

CHAPTER SIX: SUMMARY, CONCLUTION AND RECOMMENDATIONS

6.0 Introduction

The purpose of the study was to access the competencies of student‟s performance in conventional lathe machining at the Higher National Diploma (HND) level. Specifically, students and instructors or lectures were explored in their teaching and learning of practical skills. However this chapter presents the summary, conclusion and recommendations of the findings to the study.

6.1 Summary of the Main Findings

The significance of the main findings to the research study was to ascertain through research question, observation and interviews and find solution to the main research questions.

1. It is evident through this research that generally, the polytechnics are not adequately equipped with conventional lathe machines as well as tools and equipment.
2. Although few competencies were stated depending on the individual instructors‟ ability to lecture, but lack standard, uniform and consistent lathe competencies. However, polytechnics train students with different lathe competencies in various institutions.
3. It was imperially revealed that student level of standard performance was not quite appreciable due to the fact that students never acquire the needed skills to operate the lathe machine.

4. Instructors have personalized strategies but not common and concrete, indicating that the institutions lack a carefully devised planned and strategies which are universal and standardize to accelerate knowledge skills in lathe machine operation.
5. The study precisely exposed that the effect of low performance of (HND) graduate in the use of the conventional lathe machine were due to pessimistic attitude of students towards practical lesson, lack of monitoring and assessment of practical work, lack of training instructors, large student ratio to a lecturer and to a machine, less time allocation for practical lesson, insufficient machines, tools and equipment. Students are not sanctioned for neglecting or failing practical lessons.

6.2 Conclusion

On the basis of the findings obtained in the study the researcher made personal interpretations to the facts the study uncovered so as to establish an unambiguous answers to the research question posed by the study. However, the researcher maintains fairness and made the following conclusion to the findings of the study.The study had revealed that practical lesson period within the work was very small due to the limited time allocated on the time table, and in effect less hours for practical lesson. However majority of instructors may prevent students from operating the machine at their leisure time as students see practical‟s as disturbance.It was found that numbers of students for practical classes were too large. Also there seems to be difficulties in organizing the workshop for practical lesson.

The extent to which machines are checked and lubricated grant safety to the operator and long life of machines, meanwhile students acknowledge the multi operational function of the lathe machine and could observe the treacherous aspect of the lathe machine that requires alertness in its operation.

It was also attributed that most student were not aware of other work holding method apart from the chuck and seems to acquaint to the use of three-jaw chuck being the easier work setting as compare to the four-jaw chuck. This was also indicated that students had much lessons in four-jaw chuck as it gives higher precision of work setting.

Besides, the study revealed that students do not have methodical explanation on functions lathe parts, most especially, the compound slide and the saddle in turning operation. Meanwhile students find it difficult in facing a work piece with cross slide as well as different direction of cross slide and compound slide.

The research also exposed the theoretical performance of student on the use of mandrels without the practice of it but have fair skills knowledge about differentiating the drilling and boring operation, more so, instructors demonstrate the importance of graduation on the tail stock sleeve to students during drilling and boring operations.

The study further lay open that instructors fail to demonstrate the use of reamers for checking drilled or bored holes. Whiles most student have less idea about using taps and dies to start threading or cut thread on work piece held in the lathe machine.

Nevertheless, students have had much knowledge from lectures through theoretical or practical lesson about parting off, undercut and knurling operations which require special tools, although due to fear of damage or improper use of machines. Instructors hesitate to permit students to use the lathe machine at their leisure time and the unfortunate issue was that even though machine could be made available but most students refuse to attend practical lessons at their leisure time due to their negligence, lukewarm attitude, and complacency attitude and over confidence. Students seem to have theoretical idea about setting work, measuring work and checking work with their respective instrument and equipment. The research signifies that instructors have much experience to evaluate students on practical lessons, meanwhile, the year two students lack practical lesson as students understand the functions of lathe parts before operating the lathe machine. Students may also have low performance because of fewer hours for practical lessons.

Another important fact to notice was either the workshops have less number of machines, not the required type of machines, and faulty machines that lack maintenance. However, instructors patiently explain practical lessons to students but teaching and learning skills may be affected due to poor ratio of conventional the machine to number of students.

The result of study signals that student could increase the knowledge of their practical skills by making use of an access to machine at any time. Although practical lessons could not be viable due to lack of requisite tools and probably student‟s standard performance would not be attained because they did not acquire

the fullest skills before being promoted. Meanwhile instructors adopted demonstrating and competency based approach in teaching practical lessons.

The main problems is un-conducive workshop that has affected the well-organized workshop for practical lessons and for that matter, practical lessons was not carefully planned as the relevant strategy. It was noted that individual instructors take on varying methods and strategies in teaching practical lessons in the various institutions. However, student‟s competency skills believe to fade due to unplanned competency approach and principles.

It has also been found out that, students were not taken through other vital lathe competencies by instructors. The findings have also revealed that, there are challenges facing the institutions, individual instructors, and the students as a whole, as originated from instructors suggestions of ways to improve teaching of practical lessons.

6.3 Recommendations

The findings made to the problems of the study were discussed, interpreted and conclusions were also formulated. However, the following recommendations and suggestions will go a long way to improve the competencies of student‟s performance in lathe machine operations in the polytechnics.

1. The Rectors of the various institutions should collaborate with the Ministry of Education to equip all the institutional workshops with requisite and adequate lathe machines together with sufficient tools and equipment.
2. The National Accreditation Board of Professional Technical Examination (NAPTEX) of Tertiary Institution should team up with Employment Aspect

of Industrialization (EAI) to draw up general and standard competencies needed in operating the lathe machine to cover up the middle man power level status.

3. There should be a forum that will enable the Head of department and the instructors to advice students to set up their effort on practical skill with the intention of making good use of their leisure hours to operate lathe machine and take every practical hours and lessons serious so as to acquire the fullest needed skills in lathe operation before graduating to the subsequent year. Strictly, failure to acquire the needed practical skill should attract repetition of class or withdrawal.
4. The Head of department and instructors should endeavor to derive a strategy for teaching practical lessons that are of more competency base approach, systematic manner and stimulus in nature with concentrated monitoring, assessment and time deliberate method not to derail the student level of standard performance.
5. The Head of Department should team up with the instructors and the guidance and counselor to put some kind of mechanism in place with the purpose of checking students unwilling attitude towards practical lesson, reduce large student ratio to a machine in addition to a lectures and allocate sufficient hours for practical lesson.
6. The Rectors of the institutions together with Head of Department should organize in-service training in competency based approach to lectures, instructors and workshop attendants in relation to workshop practical skills in conventional lathe operation.

7. The Head of Department should provide suitable and adequate materials for the practical training lessons and monitor every stage of work assignment.
8. Heads of Department should assist instructors and practical lecturers to acquire stimulation lathes for the demonstration of every lathe practical lesson that will be taught.

6.3.1 Suggestion for Further Research

Notwithstanding the diminishing nature of student poor performance in the competency skills, much has to be developed or modified in the academic progression of Higher National Diploma (HND) level in the competency of practical lathe operation in the Polytechnics. With this; the following suggestions are made for the further researcher to be able to carry out more meaningful research work.

1. It is suggested that the study should be replicated to include three other institutions to become a total of five.
2. It is suggested that the respondents should include the Head of Department of the Mechanical Engineering
3. Recommending additional data collection strategy by using the structured interview.
4. The study must be conducted in different five set of Polytechnics.

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APPENDIX I

UNIVERSITY OF EDUCATION WINNEBA-KUMASI

COLLEGE OF TECHNOLOGY EDUCATION

(SCHOOL OF GRADUATE STUDIES)

DEPARTMENT OF DESIGN AND TECHNOLOGY

QUESTIONNAIRE FOR MECHANICAL ENGINEERING STUDENTS

The Competencies and Strategies needed for students performance of HND level engineers, for that matter Mechanical engineers on the Conventional Lathe machine, for some time now has not seen much achievement. The researcher is seeking information on the topic; **'***An Assessment of Competencies of Students Performance in Conventional Lathe Machiningat the Polytechnics".*

Kindly respond to the following questions to help research into this topic. Your input is much relevant and will be treated confidential

Instruction: Tick **(√)** where appropriate and write briefly where necessary.

A: Background Information

(1)Name of Institution.....

(2) Department: .....

(3) Area of specialization (Field of study):

[ ] Mechanical Engineering

[ ] Agricultural Engineering

[ ] Automobile Engineering

(4) How long have you been using the workshop related to your special field of study?

[ ] More than 4 years ago

[ ] 3 years ago

[ ] 2 years

[ ] 1 year

[ ] less than 1 year

(5) How often do you attend practical training on the lathe machine within the week?

[ ] More than three times a week

[ ] Thrice a week

[ ] Twice a week

[ ] Once a week

[ ] Not at all

(6)How many hours do you spend on the lathe machine during practical training?

[ ] More than 1hour

[ ] 1 hour

[ ] 30 minutes

[ ] 20 minutes

[ ] None

(7)Do you have extra time schedule for practical training apart from the time table?

[ ] Yes

[ ] No

[ ] Sometimes

(8) The workshop is well equipped with conventional lathe machine adequate for practical training.

[ ] Yes

[ ] No

(9)What is the ratio of students to lathe machine during practical training?

[ ] More than 20 students to 1 lathe

[ ] 10 students to 1 lathe

[ ] 5 students to 1 lathe

[ ] Less than 3 students to 1 lathe

(10) Practical lessons are well organized by the instructor for students to understand.

[ ] Yes

[ ] No

[ ] Sometimes

B: Competencies

Questions	Response				
	Strongly Agree (4)	**Agree (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**Don't Know (0)**
11. Lubrication, belt tension, switches are checked before starting the lathe machine.					
12. The lathe machine can perform almost all operations than any other mechanical machine.					
13. Operating the lathe machine requires more alertness than any other machine.					
14. The chucks are the only means of holding components on the lathe machine.					
15. Setting work in the three-jaw chuck is more difficult than the Four –jaw chuck.					
16. The four-jaw chuck gives much precision in setting work on the lathe.					

17. The turning operation is done on the lathe machine mostly with the compound slide.	
18. The cross slide is mostly used when performing facing of component.	
19. The cross-slide and the compound slide move in the dame direction.	
20. Mandrels are used to enable a bored work piece to be located between centres on the lathe.	
21. Drilling and boring operations on the lathe machine are the same.	
22. Drilling and boring operations all requires proper use of the tail-stock measurement.	
23. Reamers are used on the lathe to check sizes of drilled holes.	
24. Taps and dieses can be used on the lathe machine to cut threads.	

25. Parting-off, undercut, knurling are special operations that requires special tools on the lathe.	
26. Instructors allow students to operate lathe machine at their own leisure time	
27. Students operate the lathe machine at their own leisure time	
28. Micrometer, vernier calliper and steel rule are normally used to measure component being produced by the use of the lathe machine.	
29. Plug guage, snap gauge, outside and inside callipers are normally used for checking component that are being produce by the lathe machine.	
30. Work is being set with the dial test indicator (DTI) and scribing block before starting machining a component.	

APPENDIX II

UNIVERSITY OF EDUCATION WINNEBA-KUMASI

COLLEGE OF TECHNOLOGY EDUCATION

(SCHOOL OF GRADUATE STUDIES)

DEPARTMENT OF DESIGN AND TECHNOLOGY

QUESTIONNAIRE FOR MECHANICAL ENGINEERIMNG LECTURES/ INSTRUCTORS

The Competencies and Strategies needed for students performance of HND level engineers, for that matter Mechanical engineers on the Conventional Lathe machine, for some time now has not seen much achievement. The researcher is seeking information on the topic; **'***An Assessment of Competencies of Students Performance in Conventional Lathe Machine at the Polytechnics".*

Kindly respond to the following questions to help research into this topic. Your input is much relevant and will be treated confidential.

Instruction: Tick **(√)** where appropriate and write briefly where necessary.

A: (a)Name of

Institution.....

(b) Department: .....

(c) Area of specialization (Field of study):

[ ] Mechanical Engineering

[ ] Agricultural Engineering

[ ] Automobile Engineering

(d) How long have you been using the workshop related to your special field of study?

[ ] More than 4 years ago

[ ] 3 years ago

[ ] 2 years

[ ] 1 year

[ ] less than 1 year

(e) Which year group do you handle for practical lessons?

[ ] One

[ ] Two

[ ] Three

[ ] Others, specify .....

B.

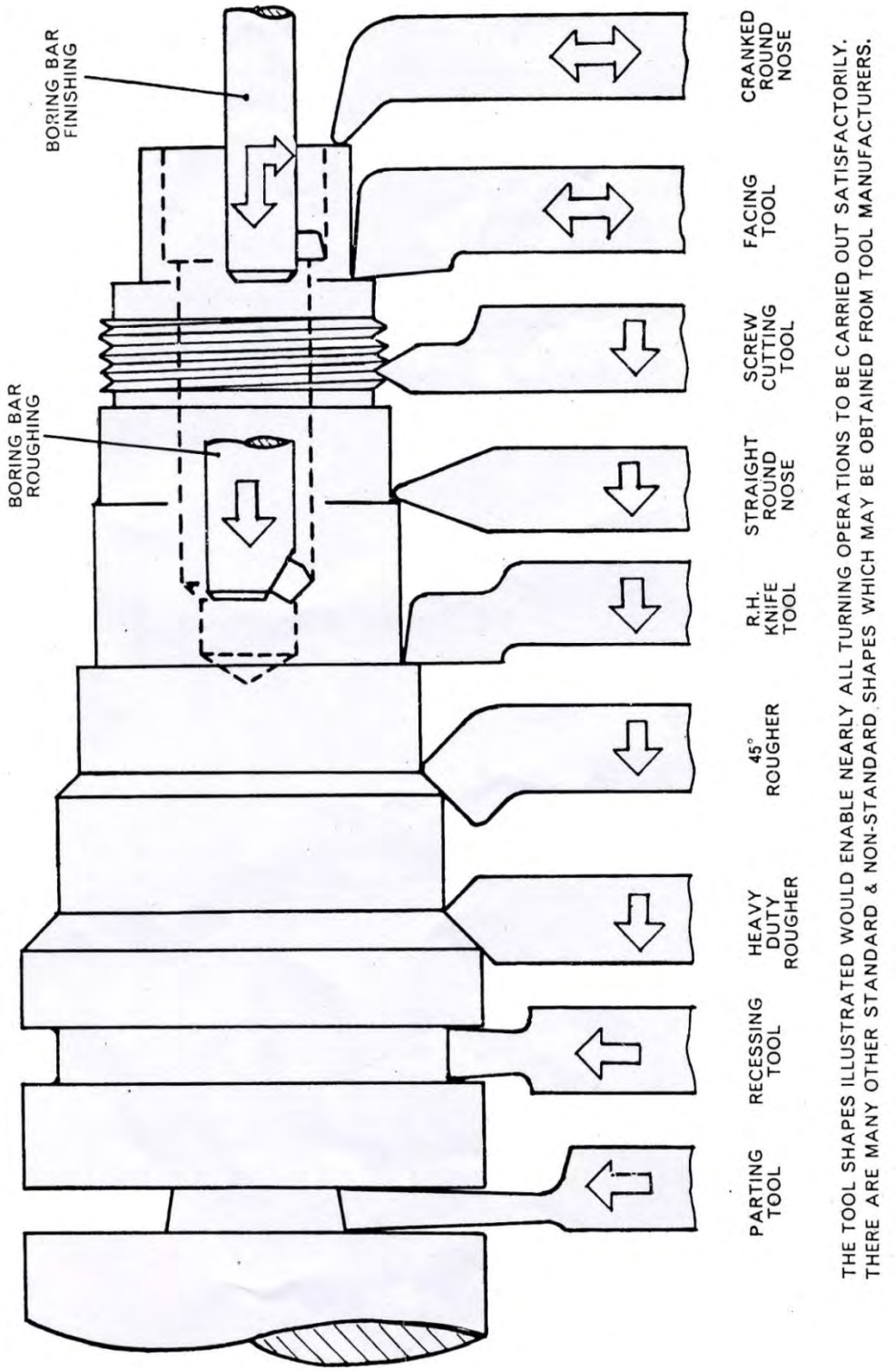
Questions		Response				
		Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**	**Don't Know**
1.	Parts and functions of the conventional lathe are well introduced before operating the machine.					
2.	Enough contact hours is given to practical lessons on the timetable.					

3.	The required machines and equipment for teaching and learning are available at the workshop.	
4.	There is much interaction between the instructor and the students during practical lessons.	
5.	The ratio of machine (conventional lathe) to student is good.	
6.	There is access to the Conventional lathe machine anytime at the workshop.	
7.	Requisite tools for teaching and learning practicals are readily available in the workshop.	
8.	The needed skills to operate the lathe machine to the fullest are acquired before graduating from one year to the other in the department.	
9.	There is much emphasis on acquiring practical skills than the theoretical knowledge in the instructions/teaching.	

10	The workshop is well organized for practical lessons and training.	
11	What is a Strategy?	....
12	What strategies do you use in teaching practical lessons on the conventional lathe machine? *(List at least 2)*	1. ..... 2. .....
13	How do you understand the term „Competency“	....
14	List four (4) competencies that can be acquired on the conventional lathe machine.	(i) ..... (ii) ..... (iii) .....
15.	Suggest three (3) ways of improving the teaching of practical lessons.	(i) ..... (ii) ..... (iii) .....
16	What factors that affect the poor performance of HND students in the use of the lathe machine? *(list at least 3)*	(i) ..... (ii) ..... (iii) .....

APPENDIX III

SELECTION OF TOOLS SHAPES AND THEIR OPERATIONS



APPENDIX IV

INTRODUCTORY LETTER FOR DATA COLLECTION

College of Technology Education, Kumasi
UNIVERSITY OF EDUCATION, WINNEBA
P. O. Box 1277, Kumasi - Ghana Tel:03220 53607,50331,53616 Fax03220 50039

UEW/KC/Tech/A.15 Department of Design & Technology Education

Our Ref.....

Your Ref.....

August 13, 2013
Date.....

TO WHOM IT MAY CONCERN

Dear Sir,

LETTER OF INTRODUCTION

The bearer of this letter Mr. Agutey-Mensah Stephen (Index no. 7111226017) is a student pursuing Master of Technology (M.TECH)) in Mechanical Technology at the College of Technology Education, Kumasi of the University of Education, Winneba.

He currently needs to visit your establishment to collect data to assist him to write his final thesis in partial fulfillment for the award of his M.Tech degree.

His thesis topic is "An Assessment of Competencies of Student Performance in Conventional Lathe Machining: A Case Study of Koforidua and Accra Polytechnic".

We wish to state that any data that will be obtained from your establishment shall be treated as confidential and used for academic purpose only.

We should be grateful if he is offered the needed assistance.

Thank you.

Yours sincerely,

S. V. Buor-Frimpong
Head of Department

E-mail:uewk@ksi.uew.edu.gh