

# UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTIVENESS OF COMPETENCY-BASED TRAINING ON THE ACQUISITION OF  
INDUSTRY DESIRED COMPETENCIES OF AGRICULTURAL ENGINEERING  
STUDENTS IN TAMALE POLYTECHNIC, GHANA

ABOKO AKUDUGU

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STUDENTS IN TAMALE POLYTECHNIC, GHANA

BY

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**UDS/DIC/0008/12**

THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL EXTENSION,  
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FOR THE AWARD OF DOCTOR OF PHILOSOPHY DEGREE (PhD) IN  
INNOVATION COMMUNICATION

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## DECLARATION

### STUDENT

I hereby declare that, this thesis titled “Effectiveness of Competency-Based Training on the Acquisition of Industry Desired Competencies of Agricultural Engineering Students in Tamale Polytechnic, Ghana” is the result of my own original work, and that no part of it has been presented for another degree in this University or elsewhere.

Candidates Signature..... Date.....

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### SUPERVISORS

We hereby declare that, the preparation and presentation of the thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

Principal Supervisor’s Signature.....Date.....

Name: Dr. Francis K. Obeng

Co-Supervisor’s Signature.....Date.....

Name: Professor Seidu Al-hassan, Ph.D.



## ABSTRACT

The Competency-based training model was piloted from 2005-2008 in selected polytechnics in Ghana. The experimented curriculum has been adopted for the training of Agricultural Engineering students on the Higher National Diploma (HND) programme. Despite its adoption, little academic research exist to ascertain its effectiveness or otherwise. This study employed descriptive survey to establish the effectiveness of CBT on agricultural engineering students' acquisition of competencies needed for the world of work. A multi-stage sampling technique was used to select a total of 190 respondents which comprised of students, lecturers and industry supervisors. The findings indicate positive significant effect of CBT on students' acquisition of industry desired competencies as assessed by students, lecturers and industry supervisors. Students' competencies improved significantly in all the 19 industry desired competencies 'before' and 'after' their industrial attachment training. Moreover, lecturers also assessed students to be competent in 18 out of the 19 industry desired competencies that were investigated. Equally, industry supervisors assessed students to be competent in 15 out of the 19 competencies investigated. All the six assessment components employed in the assessment of students were deemed suitable as assessed by students and lecturers. The study also revealed that, majority of the students favour variation in the grading system because their competencies defer. Lecturers and students assessed all learning facilities to be inadequate. The study revealed insufficient places for industrial attachment, inadequate financial support, accommodation constraints, lack of a well-resourced workshop and absence of demonstration farm for practicals as the five top most constraints that bedevil the programme. The survey showed a statistically significant relationship between students



‘ages’ and their ‘problem solving skills’. Besides, the survey also showed that, there is a statistically significant relationship between ‘profession of parents of students’ and their ‘ability to transfer skills learnt to practical situations’. In the same vain, there were statistically significant relationship between ‘ages’ of students and the ‘educational background of their parents; on one hand, and their ‘self-confidence’ on the other hand. From the survey, it was found that, there was a statistically significant relationship between ‘lecturers’ length of service’ and ‘CBT’ on one hand, and their ‘problem solving skills’ on the other hand. Besides, there was a statistically significant relationship between lecturers’ ‘ages’ and ‘academic qualifications’ on one hand, and students’ acquisition of ‘critical thinking skills’ on the other hand. Moreover, the results showed a statistically significant relationship between lecturers ‘length of service’ and students ‘ability to transfer skills learnt to practical situations’. Statistically significant differences were found in competencies as assessed by industry and polytechnic supervisors in students’ ability to network in a variety of situations, ability to self-reflect actions, knowledge of ICT skills needed for work place, awareness of leadership skills needed to lead others, and group decision making through dialogue. Interviews and Observations were also undertaken to corroborate these findings. To this end, the study recommends for the provision of relevant learning facilities to help students acquire these hands-on skills. The study also recommends for variation in the grading system that would recognise differences in students’ competencies. Equally, both lecturers and industry supervisors should be trained to enable them assess students properly.



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## DEDICATION

This research is dedicated to my late father, Mr. Aboko Aduku, for his sacrifices, encouragement, and support in my educational endeavours. He taught me the value of education and the benefit of continuous effort, and inspired me to dream and to persevere.



## TABLE OF CONTENT

<b>DECLARATION</b> .....	i
<b>ABSTRACT</b> .....	iv
<b>ACKNOWLEDGEMENTS</b> .....	vi
<b>DEDICATION</b> .....	vii
<b>CHAPTER ONE</b> .....	1
<b>INTRODUCTION</b> .....	1
1.0 Background to the Study .....	1
1.1 Competency-Based Training .....	2
1.2 Justification for Competency-Based Training in Ghana.....	4
1.3 Polytechnic Education in Ghana .....	5
1.4 NUFFIC Project in Ghana .....	9
1.5 Problem Statement .....	11
1.6 Research Questions .....	12
1.7.1 Major Objective .....	12
1.7.2 Specific Objectives.....	13
1.8 Hypotheses of the study.....	13
1.9 Significance of the Study.....	14
1.10 Scope / Limitation of the Study.....	15
1.10 Operational Definition of Terms .....	16
1.12 Organisation of the Thesis .....	17
<b>CHAPTER TWO</b> .....	18
<b>REVIEW OF RELATED LITERATURE</b> .....	18
2.0 Introduction.....	18
2.1 Empirical Literature .....	18
2.2 Engineering and CBT .....	25
2.3 CBT and Industry Participation .....	29
2.4 Justification for ‘On’ and ‘Off’ Campus CBT.....	34
2.5 Learning Facilities and CBT.....	39
2.6 Lecturers’ Demographics and CBT.....	41





2.7 Students' Demographics and CBT .....	47
2.8 Assessment of CBT .....	51
2.9 Grading System for CBT .....	54
2.10 Rationale for CBT Programme .....	58
2.11.0 Competency Models .....	66
<b>2.11.1 Katz's Model</b> .....	68
<b>2.11.2 McClelland's Model</b> .....	69
2.12 CBT and Traditional Approach to Training .....	71
<b>2.13 Fallouts from the Competency Construct</b> .....	74
2.14.0 Skills, knowledge and Attitudes for Work .....	77
<b>2.14.1 The Skills Debate</b> .....	77
<b>2.14.2 Understanding Skills</b> .....	80
<b>2.14.3 Skills Complexity</b> .....	82
<b>2.14.4 Skills for Employability</b> .....	84
<b>2.14.5 Knowledge and Work</b> .....	87
<b>2.14.6 Attitudes and Work</b> .....	89
2.15. Conceptual Framework of CBT in Tamale Polytechnic .....	91
<b>2.15.1 Independent Variables:</b> .....	93
<b>2.15.2 Intervening Variables</b> .....	96
<b>2.15.3 Dependent variable: Desired Competencies for Students</b> .....	97
CHAPTER THREE .....	100
METHODOLOGY .....	100
3.0 Introduction .....	100
3.1 Research Design .....	100
3.2.0 The Study Area - Tamale Polytechnic .....	101
<b>3.3.1 Student Population of Tamale Polytechnic</b> .....	103
<b>3.3.2 The Agricultural Engineering Department</b> .....	103
3.4. Population and Sampling Procedure .....	104
3.5.0 Data Collection Methods and Instruments .....	107
<b>3.5.1 Administration of Questionnaire</b> .....	108
<b>3.5.2 Validation and Reliability of Research Instruments</b> .....	109



3.5.3 Interviews.....	112
3.5.4 Observation.....	115
3.6.0 Method of data analysis .....	117
3.6.1 Quantitative Data Analysis.....	117
3.6.2 Hypotheses Analysis .....	119
3.6.3 Qualitative Data Analysis .....	120
CHAPTER FOUR .....	124
RESULTS AND DISCUSSION.....	124
<b>Introduction</b> .....	124
4.0 Demographic Characteristics of Respondents .....	124
4.1.1 Sex of Students: .....	124
4.1.2 Age of Students:.....	126
4.1.3 Occupation of Students' Parents:.....	127
4.1.4 Educational background of parents:.....	127
4.1.5 Sex of Lecturers:.....	128
4.1.6 Age of Lecturers: .....	129
4.1.7 Lecturers Academic Qualifications:.....	130
4.1.8 Experience of Lecturers: .....	131
4.1.9 Training in CBT: .....	131
4.1.10 Knowledge in ICT: .....	132
4.1.11 Sex of Industry Supervisors: .....	133
4.1.12 Age of Industry Supervisors:.....	134
4.1.13 Type of industry: .....	134
4.1.14 Experience of industry supervisors:.....	135
4.1.15 Academic Qualifications:.....	136
4.4. CBT effectiveness as assessed by Students, Lecturers and Industry Supervisors .....	137
4.5 Students Competency levels before and after practicals as assessed by first years.....	146
4.6 Suitability of CBT assessment system as assessed by Lecturers and Students.....	150
4.7 Variation or Maintenance of Grading System as determined by Lecturers and Students .	152
4.8 Adequacy of Learning Facilities for CBT as assessed by Students and lecturers .....	157
4.9 Constraints of the CBT programme as assessed by polytechnic lecturers.....	164



4.10.0 Hypotheses Testing .....	169
<b>4.10.1 H<sub>01</sub>: There would not be any significant association between selected demographic characteristics of students on CBT and their acquisition of competencies as assessed by first year students.</b> .....	169
<b>4.11.2 H<sub>02</sub>: There would not be any significant relationship between the demographic characteristics of lecturers and students competencies as assessed by Lecturers.</b> .....	174
<b>4.12.3 H<sub>03</sub>: There would not be any significant relationship between demographic characteristics of industry supervisors and students acquisition of desired competencies.</b> .....	181
<b>4.13.4 H<sub>04</sub>: There would not be any significant difference in the preferred grading system for the CBT as assessed by lecturers and students.</b> .....	184
<b>4.14.5 H<sub>05</sub>: There would not be any significant differences in student’s competencies as assessed by polytechnic lecturers and industry supervisors</b> .....	186
CHAPTER FIVE.....	192
SUMMARY, CONCLUSION AND RECOMMENDATIONS .....	192
5.1 Summary of Findings .....	192
5.2 Conclusion.....	199
5.3 Contribution to Knowledge .....	201
5.4 Recommendations.....	202
5.5 Implications for Further Research.....	204
<b>REFERENCES:</b> .....	206
<b>APPENDIX I</b> .....	240
APPENDIX 1A.....	241
APPENDIX 1B.....	243
APPENDIX 1C.....	247
<b>APPENDIX 2</b> .....	249
<b>APPENDIX 3</b> .....	250



## LIST OF TABLES

### Table

4.1 Demographic Characteristics of Students	127
4.2 Teachers Demographic Characteristics	130
4.3 Demographic Characteristics of Supervisors at the Industry Level	134
4.4 CBT Effectiveness assessed by Students, Teachers and Industry Supervisors	139
4.5 Competency levels before and after Training as Assessed by first years	148
4.6 Suitability of CBT Assessment System as Assessed by Teachers and Students	153
4.7 Preferred Grading System as determined by Teachers and Students	158
4.8 Adequacy of Learning Facilities as assessed by Students and Teachers	159
4.9 Constraints of the CBT programme as assessed by Polytechnic Teachers	170
4.10 Demographic Characteristics of students and their competencies.	175
4.11 Demographic Characteristics of Lecturers and Students Competencies.	182
4.12 Demographics of Industry Supervisors and Students Competencies	185
4.13 Differences in preferred grading system by lecturers and students	187
4.14 Differences in Competencies by lecturers and industry supervisors	189



## LIST OF FIGURES

2.0	Conceptual Framework of Competency Based Training Programme in the Agricultural Engineering Department of Tamale Polytechnic	99
3.0	Map of Ghana showing the Study Area	102



## LIST OF ABBREVIATIONS

ACG	Allen Consulting Group
ADEA	Association for the Development of Education in Africa
AE	Agricultural Engineering
CRS	Catholic Relief Services
CBT	Competency Based Training
CIPD	Chartered Institute of Personnel and Development
COTVET	Council on Technical, Vocational Education and Training
CWCC	Centre for Workplace Culture and communication
DEEWR	Department of Education, Employment and Workplace Relations
DIY	Do It Yourself
ECDVT	European Centre for the Development of Vocational Training
EPE	Educational Program Evaluation
GEA	Ghana Employers Association
GPA	Grade Point Average
HEA	Higher Education Agency
HND	Higher National Diploma
ICT	Information, Communication and Technology
ILO	International Labour Organisation
ITAC	Industry Training Advisory Committees
JICA	Japanese International Cooperation Agency
L.I	Legislative Instrument
LSC	Learning and Skills Council



MOE	Ministry of Education
NAPTEX	National Board for Professional and Technician Examination
NEC	National Employment Commission
NCTE	Technical Committee on Polytechnic Education
NCTVET	National Council of Technical, Vocational Education and Training
NCVER	National Centre for Vocational Education Research
NGO	Non-governmental organizations
NUFFIC	Netherlands Foundation for International Cooperation
OBE	Outcome Based Education
OECD	Organisation of Economic Corporation and Development
PPMC	Pearson Product Moment Correlation
PNDC	Provisional National Defense Council
ROI	Return on Investment
RPL	Recognising Prior Learning
SAEET	Strengthening Agricultural Engineering Education and Training
SPSS	Statistical Package for Social Sciences
TaMA	Tamale Metropolitan Assembly
TPSP	Tamale Polytechnic Strategic Plan
TVET	Technical and Vocational Educational Training
UDS	University for Development Studies
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UIL	UNESCO Institute for Lifelong Learning
VETEC	Vocational Education, Training and Employment Commission







## CHAPTER ONE

### INTRODUCTION

#### **1.0 Background to the Study**

The main objective of students' participation in academic endeavour is for the acquisition of skills, knowledge and ultimately changes in behaviour that will enable to them fit into the world of work. Hence, most courses of study are defined by a specific period and progression that depends on passing prescribed tests. However, at any given time during the study, the teacher is expected to be at a specific point in the course content. While not every student may progress at the same pace, the traditional system naturally requires every one to move at the same pace as the trainer (Sullivan, 1995). Tests are occasionally administered to ensure students understand the theories and principles. Test scores are often compared to determine the grades of the students.

Allen Consulting Group (ACG, 2006) observed that when a student does not perform well in a test, there is often little time for individual assistance as the teacher must move on in order to adhere to the established time schedule. While the traditional time-based approach to education has made different levels of success over the years, it may be less effective if the objective is to train students to execute specific, job-related tasks. ACG, (2006) therefore asserts that a more appropriate approach for specific job related training is Competency-Based Training (CBT) (Agodzo, 2005). With the traditional time-based approach, the unit of progression is time and it is teacher-centered. However, with the CBT approach, the unit of progression is the mastery of specific skills and is learner-centered (Marguerite, 2014).



### 1.1 Competency-Based Training

Competency-Based Training (CBT) is an evolving discourse in most professions and other fields of education. This has been amply demonstrated by several authors: (Albanese, Mejicano, Mullan, Kokotailo, and Gruppen, 2008; Brooks, 2009; Carraccio, Benson, Nixon, and Derstine., 2008; Frank and Danoff, 2007; Glasgow, Wells, Butler, Gear, Lyons, 2006; ten Cate and Scheele, 2007; and Whitcomb; 2007). CBT has been described as a learning process that leans towards training outcomes (Albanese *et al.*, 2008, Anane., 2013), which contrasts sharply with time-based credentialing (Collins, Gough, Civil, and Stitz., 2007). Kpamma, Appiah, and Mensah., (2013) asserts that CBT is a combination of skills, abilities, and knowledge needed to perform a specific task. The CBT concept is an illustration of an outcome-based approach to programme design which Agodzo (2005) explained as “Do it Yourself” (DIY).

Misko and Robinson, (2000) opined that at the centre of the CBT model is the desire to move away from a time-served method to one based on the realisation of agreed competency standards. The model is about giving industry more say, and a significant step on the route to today’s ‘industry-led’ vocational education and training system. It is a shift from the supply or a provider-driven approach, to one where training programmes are largely being determined by users or employers.

Ansah and Enerst, (2013) argued that CBT has been accepted as a quality-driven training methodology all over the world and many countries and institutions have started employing the CBT approach to skills training in their systems. Suffice it to say that in Ghana, the



approach has emerged as a useful tool that could be used to address shortfalls in contemporary approaches to training (Baffour-Awuah and Thompson 2011). The success chalked is as a result of the active participation of industry in the delivery of CBT in the country. This has been made possible because of the involvement of Industry Training Advisory Committees (ITAC) in the design of training and work-related standards and assessment of graduates (Afeti and Adubra, 2012). Nonetheless, the success of CBT requires periodic and timely internships for lecturers who are trained for CBT delivery to enable them to have regular exposures to new technologies that are relevant to industry.

Boahin and Hofman, (2012) asserted that the Competency-Based Training (CBT) is demand-driven and outcomes are based on standards generated from industry. Such standards form the basis upon which curriculum assessment and learning materials are designed and developed. CBT is an approach that allows students to earn qualifications through demonstration of skills and knowledge in a required subject area using a series of carefully designed assessments. Marguerite (2014) observed that under the CBT approach, each learner is assessed to find the gap between the skills they need as described in the training module and the skills they already have. The difference between the two is the skills gap. A training programme is then developed to help the learner acquire the missing skills. With this model, instead of focusing on credit hours, qualifications are awarded through tangible evidence of learning. Outcomes and assessments are the bookends of CBT. This is in contrast to the traditional form of training which places emphasis on theoretical aspects of skills training. CBT is expected to enhance individual industry specific needs rather than the group (Anane, 2013 and Albanese *et al.*, 2008).



## **1.2 Justification for Competency-Based Training in Ghana**

In Ghana, there has been a notable wide-ranging gap in skills acquisition from the polytechnics and industries for the needed skills. The skills improvement as well as hands-on training have the capacity to enhance industrial growth and development. The absence of training in practical and entrepreneurial skills remains a recurrent point of criticism in formal employer feedback from Ghana Employers Association (GEA, 2006). As a result, students are attached to industries for three months as the first step towards inculcating practical knowledge and skills in their area of discipline. This is aimed at addressing the notable deficiencies in the theoretical method of training which became evident especially among the Agricultural Engineering students.

Obeng, Adjaloo, and Amrago, (2013) argue that the requisite skills required by industries and those assumed to be acquired from the polytechnics appear to be sub-standards when viewed against the competencies required for performance on-the-job. In their tracer in Ghana, Boahin and Hofman (2012) reported that 28% of polytechnic graduates undertake professional formal training after completing their programmes. In their study, 33% of the graduates from the business programmes undertake further formal training after completing their study programme, while 25% from the engineering and applied arts, and 19% science and technology programmes respectively were involved in further training.

It was envisioned that the development of agriculture as a business would involve an increase in demand for skills to operate and maintain the technical infrastructure that is needed with regard to irrigation, mechanisation, food storage, processing, transport and



that has reinforced government's commitment to establish two agricultural marketing centres in the country (GoG, 2013). Hence, Competency-Based Training is driven through the skills-gap identification and re-modeling or improvement in skills and knowledge of the would-be graduates of Agricultural Engineering.

GoG (2013) pointed out that although several government's policy initiatives have been implemented, there is still the need to increase the skills level of the workforce in order to support industries to increase productivity. Ayariga (2013) therefore concluded that this would help address unemployment challenges bedeviling the country. GoG (2010) in its report added that inadequate level of skilled labour is making it impossible for manufacturers to be competitive. It is therefore the expectation of all stakeholders that the CBT would help address the skills gap in the Agricultural Engineering graduates from the polytechnics.

### **1.3 Polytechnic Education in Ghana**

In the last few decades, the polytechnic educational system in Ghana has undergone transformation aimed at bridging the skills gap. The technical training provided at this level was to enable students to acquire theoretical knowledge with little or no hands-on practicals. With this development, industries were left with no options than to use quality time to re-train new employees through the provision of on-the-job training. The promulgation of the Act of Parliament, 321 in 1992 for the establishment of Polytechnics, and the subsequent enactment of Act 745 in 2007, placed emphasis on Technical and Vocational Educational Training (TVET). It suffice to say that both Acts mandated the



polytechnics to train graduates for industry, commerce, business and administration with industry demand driven skills to help stem the tide of unemployment in the country. Akyeampong (2010) argued that TVET was modeled to provide apprenticeship training for the unemployed using the vocational and technical institutions. The changes were aimed at improving the educational system to produce the right competencies for polytechnic graduates for national development.

Despite these initiatives, the educational system was still fraught with limited needs analysis, infrastructure and inadequate qualified staff among others. Obeng *et al.*, (2013) stated that most training programmes in Ghanaian institutions are not managed based on effective needs analysis and it is therefore in the process of conducting skills assessment to assist them provide trainees with industry needed skills. Akyeampong (2010) indicated that several training institutions in Ghana are turning out graduates whose skills were at variance with the needs of industry. There is complete absence of scientific training-needs assessment in most Ghanaian public and private institutions on programmes they run. Akyeampong (2010) identified the main reasons for these problems as: training programmes are not based on identified needs, lack of a systematic training process, lack of training programme evaluation methods, lack of effective training methods, and lack of effective trainer-selection criteria.

Temu, Mwanje, and Mogotsi, (2003) in their study concluded that training provided to agricultural professionals in Africa and in Ghana in particular is primarily centered on programmes inherited from its colonial masters. They argued that the programmes content



were based on philosophies designed to facilitate the production of cash crops to feed industries of colonial masters (UK). They further contended that the lecturing and learning aids used are often not customised to meet the local needs. Most graduates obtain their academic qualifications in institutions with course contents designed to serve large-scale, capital intensive agricultural systems. Thus, without localisation of the curricula, the dairy, beef, pig, poultry, maize, vegetable and horticultural models employed have imperfect bearing to a remote, and under resourced rural farmer in Africa.

Bekunda *et al.*, (2007) observed that delivery of the programme has been founded on recollection of facts and reproduction of similar information at test or examinations. The technique depended principally on over 70% of lectures and 10 - 30% for practicals. Orthodox evaluation of students using closed book examinations is the common practice. There is little or minimum interface with farming communities to expose students to practical realities of the learning programme. Besides, most of the agricultural learning institutions are located in urban areas where there are no nearby farming communities to work with and as such, communities that are supposed to benefit from the programme are not benefitting. As a result of the absence of effective collaboration between the polytechnic on one hand and the communities and the private sector on the other hand, participatory mechanism that was institutionalized to incorporate stakeholder input in terms of the design and delivery of the programme is not effective.

The Ministry of Education, Science and Sports (MOESS, 2008) reported that formal Technical, Vocational Education and Training (TVET) in Ghana is currently limited in



scale, scope, quality and relevance. The TVET is largely oriented towards formal employment rather than informal employment. At the same time, most of the TVET programmes are out of touch with the needs of formal industry; curricula are outdated, many TVET institutions lack tools and equipment (and where present, machinery are often decades old and bear little resemblance to that currently used by industry), and many instructors have little knowledge of industry needs. Pre-employment institution-based training finds it hard to connect with industry, to arrange staff and trainee industrial placements and to get industry representation on institution boards. The infrastructure in training institutions is poor with 80% having functional electricity.

Duodu (2006) asserted that most of the equipment found at vocational training institutions are unserviceable. Regarding the quality and relevance of technical training institutes in particular, the (MOESS, 2008) stated that the curricula (syllabi, textbooks) at the technical schools are obsolete and they have not seen any revision over the past 30 years. Staff industrial attachments suffer from inadequate placement opportunities, and a lack of financial incentives such as night allowances. Trainee industrial attachments suffer from a lack of insurance and inadequate placements. Formal industry in Ghana generally has the view that training can provide people with theoretical skills but not workplace skills and so graduates have difficulty obtaining employment, especially formal jobs (GEA, 2006). There is therefore an urgent need to help institutions reconnect with industry requirements.

Inability of the previous curricula to produce workforce with hands-on skills necessitated the incorporation of Competency-Based Training (CBT) at the Polytechnics. This aims at





providing graduates with industry needed skills. Gasper (2005) opined that the introduction of CBT into the Polytechnic system of education is intended to provide relevant skills and competencies in graduates for sustainable growth and national development. Amankwa (2011) reported that the CBT in the new education model has bearing on the 3Rs concept meaning learn what is *relevant*; learn far more *rapidly*; and learn for *redistribution*.

#### **1.4 NUFFIC Project in Ghana**

The Netherlands Foundation for International Cooperation (NUFFIC) selected Tamale Polytechnic to pilot a project on Competency-Based Training between 2005 and 2008. The project titled Strengthening Agricultural Engineering Education and Training (SAEET) at Polytechnics for Rural Development and Poverty Reduction had the main objective of strengthening the Agricultural Engineering programme for the enhancement of education and training in order that they might achieve rural development, food security and poverty reduction in Ghana (NUFFIC, 2004). The specific objectives of the project were to:

- design and implement student-centred competency-based lecturing methodology and curriculum for the Agricultural Engineering courses. This was hoped to be in line with labour market demands, incorporating issues of socio-economic relevance as well as promoting forms of creative, problem-solving approach;
- offer training opportunities for students and staff for the development of skills and knowledge in the relevant areas.

Tamale Polytechnic was one of the pioneer institutions selected in northern Ghana for the CBT focusing on Agricultural Engineering programme. The programme was intended to



enhance rural development and poverty reduction in cooperation with, and for the benefit of, Tamale Polytechnic. Since 2009, the Agricultural Engineering Department has been graduating students who have undergone 'hands-on' CBT programme.

NUFFIC (2006) conducted skills gap analysis before the take-off and the reported indicated extreme lack of interest in the Agricultural Engineering programme by students. Therefore, to make studying agriculture worthwhile, students would have to be encouraged and motivated to perceive possibilities for employment; either in governmental or non-governmental organisations. Graduates of the programme are expected to be engaged as service providers, workshop managers or in a comparable position in Agricultural Mechanisation Centres. To that extent, a key step in strategy development for the Polytechnic was to make a thorough and realistic assessment of future job opportunities for graduates to fit into the world-of-work.

NUFFIC (2004) observed that Competency-Based Training would offer good opportunities for making education results oriented to the student's professional development in the working environment. A major concern for all stakeholders in the project was that the current curriculum is not adequately attuned to the job market, and do not sufficiently distinguish graduates from comparable Bachelor's degree programmes from the universities. The fact that the entry requirements for polytechnics are lower than those in universities has led to the wrong perception that the polytechnic education is not comparable with that of the university. NUFFIC (2006) stated that there was the additional factor of the low status and limited interest in agriculture, and to a lesser extent, in



engineering. Most students take greater interest in the service sectors, such as business administration and information and communication technology.

The lack of interest contributed to a major decline in the Agricultural Engineering (AE), enrolment which signified an urgent need for a major overhaul of the Agricultural Engineering HND programme. Therefore at all levels, the introduction of CBT was perceived as a partial solution to the problem (NUFFIC, 2004). Consequently, among stakeholders, there appears to be only a partial understanding of the radical changes involved in the conversion of the traditional system of education to the CBT model. It was anticipated that there would be major changes in the overall approach to learning and lecturing as well as corresponding changes in such key elements as didactical methodology, development of curricula, and forms of assessment or examinations. Nonetheless, in view of the overwhelming recognition of the need for change, and the noted flexibility and adaptability of education officials and lecturing staff, it was agreed that even if many stakeholders are not yet fully aware of the extent of the changes the switch to CBT involves, the magnitude of change required would not become a major obstacle to project implementation (NUFFIC, 2007).

### **1.5 Problem Statement**

The NUFFIC Competency-Based Training project was piloted between 2005 and 2008 in selected polytechnics in Ghana. The experimented curriculum has been adopted for the training of Agricultural Engineering students in the Higher National Diploma (HND) programme. The National Board for Professional and Technician Examination (NAPTEX)



(2014) directed that all Departments in polytechnics should use the competency based approach in training their students. While researchers such as Thobega *et al.*, (2011) found the programme not to be effective in imparting practical skills, others like Marguerite (2014) reported that it is effective. NUFFIC (2008), and Amankwah (2011) intimated that the long term evaluation of CBT is needed to identify areas that would require fine-tuning to satisfy the needs of industry. Meanwhile, there is paucity of academic literature on its effectiveness or otherwise. It is against this backdrop that this study intends to investigate the effectiveness of CBT in equipping students with industry needed skills as implemented in Tamale Polytechnic.

## 1.6 Research Questions

The study sought to answer the following research questions.

- do stakeholders perceive CBT as an effective vehicle through which students competency levels can increase or otherwise?
- are the learning facilities provided for the CBT programme adequate?
- is the assessment model designed for the CBT programme suitable?
- should the grading system designed for the CBT be maintained or modified?
- are there constraints that impede the effective implementation of CBT?

### 1.7.1 Major Objective

The main objective of the study is to determine the effectiveness of Competency-Based Training on acquisition of industry desired competencies of Agricultural Engineering students in Tamale polytechnic, Ghana.



### 1.7.2 Specific Objectives

The specific objectives are to:

1. Determine students' competency levels during practical training as observed by students, graduates, polytechnic lecturers and industry supervisors;
2. Assess students' competency levels before and after practical training as assessed by first year students;
3. Ascertain the suitability of the assessment model designed for students on the CBT programme as assessed by lecturers, graduates and students;
4. Ascertain from lecturers, graduates and students whether the grading system designed for the CBT should be varied or maintained;
5. Determine the adequacy level of learning facilities used in training students under the CBT as observed by lecturers and students;
6. Ascertain constraints working against the effective implementation of the CBT programme as assessed by polytechnic lecturers.

### 1.8 Hypotheses of the study

These hypotheses were formulated bearing in mind the variables in this study. Hence these hypotheses were presented in the null form as presented below.

**HO<sub>1</sub>:** There would not be any significant association between the demographic characteristics of students on CBT and competencies acquired as assessed by students.

**HO<sub>2</sub>:** There would not be any significant relationship between the demographic



characteristics of lecturers and acquired competencies of students as assessed by lecturers.

**HO<sub>3</sub>:** There would not be any significant relationship between the demographic characteristics of industry supervisors and acquired competencies of students as assessed by industry supervisors.

**HO<sub>4</sub>:** There would not be any significant difference in the preferred grading system for the CBT as assessed by lecturers and students.

**HO<sub>5</sub>:** There would not be any significant difference in students competencies as assessed by lecturers and supervisors at the industry level.

### **1.9 Significance of the Study**

The CBT programme was designed to equip Agricultural Engineering students with the needed practical skills deficient in the curriculum. However, there has not been any conscious effort to assess the effectiveness of the programme since its adoption in 2005 in Tamale Polytechnic. It is therefore imperative that assessing the Competency-Based Training is a responsive approach enabling documented changes in behaviour of Agricultural Engineering graduates arising from the training received. This would enable stakeholders to know the extent to which the programme was successful or otherwise and the constraints faced in its implementation. Furthermore, the significance of the exercise lies in the fact that findings would provide information to polytechnic management, policy makers and funders of the programme. This might guide decisions on whether to continue, modify or terminate future programmes of this nature.



The study is also partly a response to calls by earlier researchers for further research on the suitability of the programme who found it not to be effective in imparting practical agricultural skills in Botswana College of Agriculture (Thobega, 2011). Besides NUFFIC (2008), and Amankwah (2011) also intimated that the long term evaluation of the programme is needed to identify areas that would require fine tuning to satisfy the needs of industry. Thus, the programme needs critical evaluation to ensure its relevance and intended purpose of imparting demand-driven practical skills to students. The theory of experience as Kolb and Kolb (2005) alluded should be reinforced with practice. Similarly, Ayariga (2013) opined that public universities and other training institutions should evaluate and restructure their programmes to correspond to the needs of industries to enable graduates to gain easy access to jobs.

#### **1.10 Scope / Limitation of the Study**

The study was limited in academic scope to all Agricultural Engineering students of Tamale Polytechnic who have been trained on the Competency-Based Training programme since 2005. The research findings would serve as baseline upon which future training programmes of this nature could be based in the Ghanaian polytechnics.

Besides, this study was partly founded on survey research which relies largely on respondents' self-reporting, where its methodology could face a lot of contestations. Notwithstanding the due diligence employed in undertaking this work, respondents might have misunderstood, or misinterpreted the meaning of questions or answers. In this regard, respondents might have given erroneous answers through deceptive acts or



forgetfulness (Groves *et al.*, 2009). Equally, survey results could also be influenced by the interest level of the respondent in the topic being studied. A respondent with high interest in a topic may devote significant time and effort to respond to the questions accurately while an uninterested respondent might opt out or be less diligent in providing answers to questions (Groves *et al.*, 2009). Despite these limitations, survey research is still the most practicable methodology that is widely used to obtain relevant data research.

This research is limited by the scarcity of academic articles focusing on the effect of CBT in equipping students with industry desired skills in Ghana. This research is intended to increase the depth of literature on the subject matter and to inform industry professionals, training institutions and policy makers on the effectiveness on CBT.

The instrument used for the study was also limited by the lack of psychometric data available, thereby limiting the ability to quantify the exactness of the measurement. In view of this, another opportunity for future research in this area would include the use of an instrument that could collect psychometric data. These limitations were managed by the use of interviews and observations to corroborate data gathered using questionnaire items.

### **1.10 Operational Definition of Terms**

**Effectiveness of CBT:** the ability of the model to assist students acquire desired competencies





**Students' competency levels:** differences found in students' competencies before and after the CBT programme

**Adequacy of learning facilities:** ability of lecturing and learning facilities used in CBT to facilitate students' acquisition of desired competencies

**Suitability of assessment model:** appropriateness of the model to evaluate competencies of students as a result of training received

**Grading system:** the act of assigning values to students' performance to determine whether they are competent or not yet competent

**Industry supervisors:** refers to supervisors at workplaces where students undertake their practical training.

### **1.12 Organisation of the Thesis**

The study is organised into five chapters. Chapter one is made up of the background to the study, problem statement, objectives and hypotheses of the study, significance of the study, and scope/limitation of the study. Chapter two deals with review of relevant literature on the study whiles chapter three contains the methodology used for the study. Results and discussions are presented in chapter four, and conclusion and recommendations are contained in chapter five.



## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

#### **2.0 Introduction**

This section presents a review of some relevant concepts that are empirical, conceptual framework that anchor, guide and also made significant contribution to the contextual understanding of the core issues in this study. Competency as an elusive concept has been an issue of concern since its construction in the 1960s in the United States of America (Boahin, 2013). Its importance has been emphasised in almost all fields, and especially in business, industry and within the educational sector. The increasing constant quest for graduates to be equipped with industry desired skills has found expression worldwide among major stakeholders. This development has given rise to the design and implementation of Competency-Based Training model that seeks to address the notable skills gaps in the world of work. Various studies conducted on CBT have reported its positive influence in the acquisition of industry desired competencies, while others found otherwise. This chapter therefore seeks to review empirical literature on CBT, and Competency-Based Training as implemented in Tamale polytechnic, and to provide a conceptual framework for the study.

#### **2.1 Empirical Literature**

Gentry (1990) argued that Competency-Based Training is an old concept and as Kolb and Kolb (2005) indicated, theory must be reinforced with sound practice to guide the conduct of both trainers and trainees. Lewis and Williams (1994) submitted that in higher training institutions, CBT could be conducted in the form of field-based experiences or crediting



prior learning. Many institutions around the world including Tamale Polytechnic are incorporating this concept in order to enhance the quality of their programmes. The University of Swaziland (UNISWA) and Botswana College of Agriculture (BCA) have similar programmes for the training of their agricultural students which have proven to be very effective in equipping students with desired competencies (Oledele *et al.*, 2011). This is designed to offer students with practical experience in the actual work environment (Moichubedi, 2003). Other institutions that have designed similar programmes for their students include California Polytechnic, which has the “learning by doing” programme that assist students acquire theoretical knowledge and hands-on skills. Equally, Iowa State University also offers “Science with Practice” programme for its students. Both programmes are meant to provide students with opportunities to learn and work experientially with faculty and staff in university research units, farms, and greenhouses through which relevant knowledge and skills could be acquired (Iowa State University, 2010)

Ogunbameru (1986) intimated that Farm Practical Year (FPY) programme is a process of gaining knowledge and practical skill through observation and participation. In Nigeria, it is a policy of the National Universities Commission (NUC) that agricultural undergraduates in the fourth year of their five-year degree programmes be exposed to farm practical (Oledele *et al.*, 2011). Henze (1984) opined that students in the past were theoretically trained in the field of agriculture which had little relevance in the world of work. Indeed, demonstrations conducted by students with the support of supervisors at the industry could complement the academic training received by students. Skillbeck (1984)



asserted that what students hear or see during the lecturing and learning process may be doubted, but what they do cannot be doubted.

Boahin (2013) in his investigation to explore “A disciplinary perspective of Competency-Based Training on the acquisition of employability skills in Ghana” found a significant relationship between academic disciplines and industry training on the acquisition of employability skills. Though the study established partial evidence on the impact of pre-education on the acquisition of employability skills, no such relationship was found between gender and skills acquisition. In the same vein, Brantuo, Cristofalo, Meheš, Ameh, Brako, Opoku, (2014) in their study found that a training provided to 278 participants and comparison of pre- and post-training test results demonstrated significant improvement in provider knowledge (73% vs. 89% correct,  $P < 0.001$ ), with even greater improvement among trainees receiving recurrent refresher training (86% vs. 94% correct,  $P < 0.001$ ). Participant feedback following training revealed enthusiasm about the programme and improved confidence. They however added that not only does this suggest that participation in the training is associated with long-term knowledge retention, but trainees can equally benefit from repeated participation and practice.

Makanjuola, Doku, Jenkins and Gureje (2012) in their study captioned “Impact of a one-week intensive ‘training of trainers’ workshop for community health workers in south-west Nigeria using the competency based model” comprising 24 participants, reported significant improvement in the knowledge and attitudes of tutors of community health workers following the training from a mean score of 60.4% before training to a mean score



of 73.7% after the training (t-test = 4.48, P = 0.001). Mohd *et al.*, (2009) reported that engineering students' perception after Industrial Training Placement in Malaysia had beneficial effect on them since it significantly improved their 'personal attitude', 'communication', and 'work attitude'. However, other researchers have asserted that spending a portion of vocational education time in the workplace may not automatically lead to the acquisition of hands-on skills (Eraut 2004; Griffiths and Guile, 2003).

Ayarkwa, Adinyira, and Osei-Asibey, (2012) in their work titled "Industrial Training of Construction Students: Perceptions of Training Organisations in Ghana" revealed that trainees showed significant level of performance in their ability to follow instructions, function in a team, and to apply knowledge gained from the university among others in an industrial training programme. However, the study noted that trainees demonstrated low level of performance in negotiation skills, independence, social and multi-racial awareness, and ability to make decisions. They recommended for the provision of guidelines for industrial training for use by host organisations, monitor trainees during industrial training; design models to cover all relevant competencies, and appoint industrial supervisors with the responsibility to provide industrial feedback to learning institutions. Windsor, Sturm, Cosman, and Hewett (2008) in their study titled "A Systematic Review of Skills Transfer after Surgical Simulation Training" discovered that participants who received simulation-based training before undertaking patient-based assessment performed better than their colleagues who did not receive prior simulation training.



On the other hand, in a study captioned Papadopoulos, Tilki, and Lees, (2004) in a study titled “Promoting cultural competence in health care through a research based intervention in the UK” in the United Kingdom reported that competency based education intervention had not been very successful and the authors postulated that this may be because the impact of such training has a longer term effect, and it may be more useful to re-assess cultural competence a number of months after an intervention when the participants have had the time to reflect on what they have learnt and put it into practice. Hardy and Parent (2003) opined that spending time in professional practice does not certainly mean that ( i) education has been integrated into the work environment; (ii) students have taken advantage of the learning resources available in the workplace(s); (iii) interrelations between theoretical knowledge and practical experiences have been addressed; or (iv) development of skills in problem-solving or the usage of learning experiences in other situations have been encouraged.

Wesselink, de Jong, and Biemans (2010) in their study captioned “Aspects of Competence-Based Education as Footholds to improve the Connectivity between Learning in School and in the Workplace” in the Netherlands revealed that in general, students do not want to return to the traditional system of vocational education mainly characterised by lecturing since they can learn a lot just by discovering for themselves or by observing their workplace training supervisors on the job. The study discovered that the lecturers’ instructions and exercises are not adequately prepared to meet the professional practice of industry and that workplace training supervisors perceive some of the exercises to be very unrealistic. Hence, competencies are insufficiently aligned with the professional



context in the industry. Lecturers submitted that current facilities were not suitable for the model and there is always a pile of paperwork for lecturers, students, and workplace training supervisors alike. They were however proud of their personal growth, improvements in education, information and communication technology, and coaching skills. Training supervisors at the industry level noted that lecturers were too busy to fulfil the tasks of visiting students deemed to be insufficiently familiar with current standards at the workplace. They added that students were generally less positive about their education than are students of the traditional system and that the model was only suitable for a minority of the students. They argued that the best teacher is the one who also works part-time as a professional in an enterprise and full-time lecturers and should take a period of retraining in professional practice. On the other hand, Eraut (2004) highlighted concerns about the correlation between theoretical knowledge and practical experiences. He quizzed whether there can be any transfer of knowledge from classroom to the workplace and vice versa.

Oloruntoba (2008) reported that for students from the University of Agriculture Abeokuta, Nigeria, practical year training programme enhanced their competencies in many agricultural tasks. Boahin (2013) found in his study titled “A disciplinary perspective of Competency-Based Training on the acquisition of employability skills”. Oledede *et al.*, (2011) reported related findings in a study to determine the effectiveness of field practical training for competence acquisition among students of Botswana College of Agriculture. Thobega *et al.*, (2011) reported similar findings in a study to determine the effectiveness of field practical training for competence acquisition among students of Botswana College



of Agriculture. This is also in tandem with the findings of (Osei, Berchie, Ansah, Gyasi-Boakye, Asante, and Adjekum, 2005; Madebwe and Madebwe, 2005) in Ghana and Zimbabwe respectively that students' practical year programme provided students with 'hands-on' experience and opportunity to apply theory learnt in the classroom to real work situation where they adapted and provided solutions to problems on the field on similar practical training programmes in Ghana and Zimbabwe.

Central to CBT also include effective participation in specific activities, reflecting on the experiences and taking active steps in experimenting with those experiences (Andreasen and Wu, 1999; Kolb, 1984). Williams (2007) observed that CBT could introduce students to experiences that could help shape and develop their knowledge, skills and attitudes. Brucing and Frick (2004) posited that following CBT, students could take advantage of outside classroom experience to create social capital since that could offer them chance to interact with professionals, and develop meaningful relationships with others. In this regard, Weng (1998) suggested that the relationship between agricultural schools and industries should be strengthened for purposes of practical training and internship programmes.

A CBT programme could face several challenges. As submitted by Everwijn, Bomers, and Knubben (1993), knowledge acquisition may not lead to successful workplace application, successful knowledge application may not be a product of conceptual grasp, subject-specific knowledge and skills may not be applied beyond the very subject, and possession of general knowledge and skills may not imply mastery over specific subject areas. They





proposed that apart from disciplinary and functional instructions, attention should be paid to the development of basic abilities and generic skills such as problem-solving, communication, information handling, social interaction and leadership.

## **2.2 Engineering and CBT**

Turmeau (1982) observed that the field of engineering dates back to 5<sup>th</sup> and 6<sup>th</sup> centuries B.C. with the fundamental responsibility of providing solutions to technological problems in society. However, engineering education has been variously criticized for not keeping pace with the constantly changing needs of industry and society as a whole. Engineering education primarily focused on knowledge acquisition at the expense of personal and social construction of knowledge that would lead to professional competence development (Lachiver and Tardif, 2002). The European Journal of Engineering Education underscored that the primary objective of engineering education is to develop professionally competent engineers (Lemaitre, Le Prat, De Graaff, and Bot, 2006).

Interestingly, Competency-Based Training in engineering education is becoming popular with stakeholders, reflecting the changing needs of society, the world of work and education (Walkington, 2002). The development of curriculum is no longer the preserve of university professors, and its design and implementation process should constructively engage all relevant stakeholders.

In recent times, some approaches have been recommended for the development of competency-based curriculum in engineering education. Lachiver and Tardif (2002)



proposed a curriculum development based on learning framework on how students learn, and conceptual framework detailing the design of learning activities. Rompelman and de Graaff (2006) recommended a system design approach where input is course content, output is students' competencies, assessment provides feedback, and lecturing becomes educational process. Sutcliffe, Chan, and Makoto (2005) submitted that CBT curriculum development process could involve four main steps namely; review of curriculum model, feedback from industry, feedback from faculty outside the system, and consultation with system faculty. It is assumed the above framework is inclusive of stakeholders' views and provides a flexible modular approach to competency-based education. Gorgone, Gray, Valacich, Stohr, and Wigand (2006) proposed a CBT curriculum for graduate degree programmes that would provide a balance of flexibility and consistency to faculty, students, and employers. This would assist graduates to be competent in a set of professional knowledge and skills that would help them embrace diversity by being sufficiently flexible to meet both industry and student needs.

Professional knowledge of engineers is no longer limited to the design of technical products, but may include customization of applications, and understanding the social context (Lemaitre, Le Prat, De Graaff, and Bot, 2006). Educational institutions have to respond to this need by adopting competence driven approach that integrates problem-based learning, with productivity improvement, innovation, and social consciousness (Chong and Crowther, 2005); Coll and Zegwaard (2006) posited that if educational institutions intend to produce graduates with skills desired by employers, it is imperative that they have complete understanding of specific skills that are desired at the workplace.



Studies in engineering education have attempted to ascertain a set of competencies required for engineering graduates in the world of work. Cabrera, Colbeck, and Terezeni (2001) investigated the relationship between CBT and acquisition of professional competencies by engineering students. They established significant positive relationship between CBT and engineering students' acquisition of professional competencies like problem-solving skills, group skills, and understanding of engineering as an occupation. In the same vein, Coll and Zegwaard (2006) asserted that highly desired competencies employers require from science and technology graduates are their ability and willingness to learn, teamwork and cooperation, initiative and analytical thinking. In a benchmark survey called Successful Practices in International Engineering Education (SPINE) that involved 543 professors, 1372 engineers and 145 corporate managers to assess the value and significance of engineering education and to identify effective practices among ten leading European and United States universities, Bodmer, Leu, Mira, and Rütter (2002) identified critical engineering competencies which are communication skills, English language skills, presentation skills, leadership skills, teamwork, problem-solving skills, and methodological skills.

The U. S, considers the desired attributes for engineers of 2020, where the National Academy of Engineering (2004) submitted that strong analytical skills, practical ingenuity, creativity, communication, business management skills, leadership and high ethical standards are critical for their effective functioning at the workplace. Chong and Crowther (2005) suggested outcomes-based model that can measure a range of student competencies, yet allow stakeholders to measure the quality of engineering education offered for purposes



of improving the curriculum. The framework called SERVQUAL-TRANS is made up of five set of outcomes dimensions which are technical competencies, generic competencies, management and organisation skills, communication and social skills, and teamwork. Lohmann, Rollins, and Hoey (2006) proposed a CBT model that would incorporate global competence dimension which would require students to have a broader interdisciplinary knowledge base, well developed interpersonal skills, and ability to live and work in a global setting.

Lattuca, Terenzini, and Volkwein, (2006) their study evaluated the impact of EC2000 on engineering students' professional preparation for the world of work. In the words of programme chairs and faculty members, their engineering programme curricula now places much emphasis on professional skills as defined by EC2000. Also, employers' indicated that the EC2000 learning outcomes are important to their hiring decisions of recent graduates. Navarro (2004) asserted that students need to prepare themselves for the world of work by learning and experiencing their environment to enable them to compete in typical agricultural occupations. Bruening and Frick (2004) found that employers in the agricultural industry of today are looking for graduates with cross-cultural experiences. In the same vein, Acker (1999) submitted that students need to examine agriculture from a system perspective, including social, biological and physical systems and that the education of prospective employees should include development of broad problem-solving skills.

Competence is a value judgment which may be presented in a particular context, culture, and socio-professional environment (Lemaitre *et al.*, 2006). This heightened emphasis on



CBT is also driven by the evolution and dominance of knowledge-based economy, which has different set of complexities and context relative to the industrial economy for which engineers are trained (Lemaitre *et al.*, 2006). There is also groundswell of support for a shift from the use of resource and status variables as predictors of students learning to emphasis on evident changes in outcomes (Cabrera *et al.*, 2001)

### **2.3 CBT and Industry Participation**

There is an increasing loss of confidence among stakeholders such as students, industry, and policymakers that the traditional educational system adequately prepares individuals to frontally deal with challenges in the world of work (Banta, 2001; Jones, 2002). Higher learning institutions are under constant pressure to convince their stakeholders about the quality of graduates they turn out (Banta, 2001; Vaatstra and de Vries, 2007). To this end, the relevancy and quality of education to meet the demands of the new economy requires collaboration across stakeholders including industry (Jones, 2002). Barnett (1994) observed that the relationship between knowledge, higher education and industry must be under constant interaction and transformation. Thus, Industry expects institutions of higher learning to develop operationally competent and efficient students. Competencies serve as a conceptual framework and a common language between education providers and employers to design curricula (Van der Klink and Boon, 2003).

In the field of engineering, evidence abound that corporate involvement and partnerships with institutions of learning nurtured the development and implementation of new programmes and curricula that are relevant to industry. Chesbrough and Spohrer (2006)



submitted that industry played a critical role in bringing credibility and acceptance of the Computer Science as a discipline. Similarly, when computer-based tools were gaining relevance in manufacturing, International Business Machines (IBM) donated ten million dollars to five universities to develop graduate programmes in manufacturing systems engineering (Dieter, 1984). More recently, IBM is taking the lead in the promotion of service science, sponsoring events, funding research and providing grants for course development (Lohr, 2006). Universities are also taking proactive role in collaborating with industry. Bodmer, Leu, Mira, and Rütter, (2002) asserted that Massachusetts Institute of Technology (MIT) actively engages with industry to offer a comprehensive, fundamental, yet practical education that are relevant to industry.

Zell (2005) posited that the business schools in 1950s and 1960s were relevant to the needs of industry, yet, they did not have academic thoroughness, and thus, were considered trade schools. In their quest to gain professional credential, the schools adopted a more theoretical and scientific approach. Embracing this scientific model led business schools to loose relevancy with the practice (Bennis and O'Toole, 2005). Enhanced engagement and involvement with industry is suggested to improve the relevancy of management education to its stakeholders (Doria, Rozanski, and Cohen, 2003; Hamilton, McFarland, and Mirchandani, 2000). Industry has the capacity of effecting changes in higher education, but business leaders have failed to demand enough from the institutions professing to serve them (Bennis and O'Toole 2005). To this end, AACSB International (2006) submitted that engaging industry leaders in discussions about curriculum, the assurance of learning process, and other assessments of learning activities could be valuable. The constantly



changing nature of the work environment is influencing the demand for a new set of professional competencies. Educational institutions play a critical role in providing talent for industry, and industry supports those institutions through funding and feedback. Thus, design and development of CBT has to be collaborative and competency driven.

Bereiter (2002) submitted that six different types of knowledge are essential to become a competent worker: i) declarative knowledge - knowledge in an explicit form, ii) tacit knowledge - understanding through experience, iii) episodic knowledge – memories events, or narratives from the past, iv) impressionistic knowledge - feelings and impressions that influence action, v) procedural knowledge - knowing how, and vi) regulative knowledge - principles and ideas that professional groups pursue in order to accomplish their work. For high level performance, these six types of knowledge should not be taught separately, but should be holistically taught by all relevant entities. Thus, it may be helpful for some to be developed in school, while others are developed at the workplace. The various components of knowledge should be developed in relation to each other, and across all settings. All learning tasks of students in schools and workplaces should be integrated to enable students to acquire the desired competencies.

Griffiths and Guile (2003) termed this CBT process of integration as Connectivity between learning activities in school and the workplace. It connotes the practice of bringing together all facets of the learning process that were hitherto disjointed (Tynjälä 2009). At the core of this model is to effectively connect formal learning to informal learning. Connectivity requires effective collaboration between educational institutions and industry because they



are both responsible for students' learning (Tanggaard 2007, Griffiths and Guile (2003) proposed four practices that can be employed in these learning environments through which this can be actualised. The first practice that is critical to all learning activities is that of thinking. It is a process guided by procedures or social interaction with dialogue and argumentation at the core of all activities. Students are therefore expected to engage in constructive dialogue and argumentation at workplaces and schools. The second important practice is called 'dialogic inquiry'. This practice gives the relatively less-experienced people the opportunity to acquire relevant competencies from more experienced ones. The third practice is referred to as "boundary crossing. With this practice, 'horizontal development' is stimulated through participation in different environments. The fourth practice is known as 'resituating' knowledge and skills. This practice assists learners to see original activities from different perspectives. Thus, students, lecturers, and industry training supervisors should employ these practices that can be supportive in achieving connectivity.

The involvement of industry is key to the effectiveness of CBT in all stages of the programme. Industry actively participate in the design of competency-standards, development and evaluation of curricula, and assessment strategies, monitoring and evaluation of training courses. It gives the learners the chance to appreciate what, how and why they are learning in the lecture theater. Moreover, Crebert, Bates, Bell, Patrick, and Cragolini (2004) added that industry participation in CBT facilitates learners' technical skills acquisition and generic skills such as communication, teamwork, problem-solving and adaptability skills that are equally needed to undertake professional tasks.





In Tamale Polytechnic, the Agricultural Engineering Department and industry collaborate to facilitate the placement, supervision and assessment of students for the duration of industrial attachment. Industrial attachment takes place during the end of the second semester of the first and second years of study which normally last longer. The attachment duration ranges from two to three months and this attracts a total of eight (8) credit hours per module. After every attachment period, the student is assessed by the organisation and the Department as well as the students' own report, which are scored as part of the semester's assessment. The organisation's assessment attracts 20%, lecturer's assessment takes 20% while the report of the student attracts 60%.

However, the involvement of industry in CBT implementation in Ghana is a disputed matter. A study by Japanese International Cooperation Agency JICA (2008) in its study found no evidence of industry participation in the implementation of CBT in the Technical and Vocational Education and Training (TVET) study programmes. The participation of industry is limited to students' industrial attachment which involves training on the job during normal operational conditions (Waterhouse and Virgona, 2004). However, Boahin and Hofman, (2012) reported that mentoring students on industrial attachment is the significant part of industry's participation in the implementation of CBT in Ghana.

The CBT also requires lecturers to get themselves placed in the labour market to help them acquire demand-driven skills and new technological applications that are relevant in the world of work which would aid them in their delivery of lessons to students and colleagues. Regrettably, placement opportunities are not enough and if found, financing becomes a



major setback. In the same vein, there exists limited placement opportunities for students who would have the desire to acquire practical skills from the working environment. As a result of the huge numbers of students, coupled with the limited availability of infrastructure, overcrowding occurs around equipment during field demonstrations and this hinders the chance of all participating students' acquisition of real hands-on experience (Van Wijk, Jansen, and Lyles, 2008). Besides, most employers have limited capacity in terms of training, mentoring and supervisory skills to manage students who are on internship in their outfits. More worryingly, some supervisors and mentors sometimes are unwilling to patiently invest quality time in mentoring students when they are slow to learn and this has the potential of affecting the skills acquisition level of trainees.

#### **2.4 Justification for 'On' and 'Off' Campus CBT**

Arthur, Bennett, Bell and Edens (2003) submitted that the effectiveness of training appears to differ as a result of the identified training delivery system, and the nature of skill being trained for. In general, CBT schemes are classified as either on-campus or off-campus. On-campus training is conducted by lecturers in the polytechnic and as Klink and Streumer (2002) stated, it is cost effective, less time involved and easy transfer of skills to the students. It is the most common method of training, and the participants can basically observe, copy and adopt the needed skills. It could also take the form of a highly structured programme provided in an office or in a workshop and such training can be done by simply watching an experienced employee, guiding, shadowing and job rotation. Largely, this type of training is suitable for new or inexperienced workers learning through observing peers or lecturers performing the tasks and trying to copy their behaviour and it normally takes



place within the learning institution. It is useful for introducing new techniques to existing workers', cross-training workers in a Department, and orientating reassigned or promoted workers to their new jobs.

It is essential that this practice could be called learning by observing and doing. The method does not require any knowledge on the part of students. It simply assumes that all students are capable of gaining skills and knowledge without any designed assistance other than the guidance of lecturers and colleagues (Akhorshaideh, 2013). To this end, if there are no incentives to learn, the results are often unacceptable, since the trainers themselves may not be well qualified. Nonetheless, as Cole (2002) submitted, on-campus training could be undertaken by using instruction, which is employed to enable trainees to acquire mundane skills in manual and clerical jobs. Under this technique, the instructors are well qualified to carry out the exercise and it is another tool lecturers use to guide students to improve upon their managerial skills in mentoring process (Torrington, Hall, and Taylor, 2002).

Again, shadowing and job rotation could be used to enable students to move to other Departments or branches of an organisation, in order to gain new skills and knowledge which this can have massive impact on the learning experience of students (Raelin, 2000). However, one setback of this technique is that students may not be accepted by their colleagues and could sometimes be seen by supervisors and other workers as impediments to their daily activities (Cole, 2002). Consequently, although rotation may expose trainees to demand-driven skills in their temporary jobs, they have limited time to reflect on these skills even if they successfully perform. Another form of on-campus training method is



cross-functional training which provides students the opportunity to work in several units in an organisation to assist them perform other tasks apart from those assigned to them (Noe, 2005).

Indeed, on-campus training is an attractive option for organisations to settle on because it does not require huge financial expenditure in order to take care of trainers' salaries, training materials, and facilities as normally done in off-campus training. The approach however has some limitations since skills and knowledge that are appropriate for the current supervisors may not be suitable for other organisations. Sambrook (2005) reported that learning that takes place within the work setting could be considered in terms of training 'at' and 'in' work. Learning at workplace is formal provision of training such as induction, and a variety of official and in-house activities. A major benefit of training at workplace is that it is held away from the formal learning environment in a designated location or technical space. On the contrary, learning at workplace is less formal and is characterised by work actions, such as asking questions, observations, problem-solving, project work, coaching and being part of multi-disciplinary teams. These undertakings may be termed as informal or accidental learning (Mumford and Gold, 2004).

CBT is at times conducted away from the place of formal academic institutions and it is done at times to take students from the immediate learning environment to a venue where frustrations of learning could be removed. Torrington *et al.*, (2002) declared that training undertaken outside the organisation could provide a variety of skills which may not be useful for in-house. This type of training is normally associated with high cost, difficulty



in simulating work problems, trainees' resistance to move away from home, and more time consuming. However, Robinson (2005) argued that this type of training offer students an opportunity to study and understand issues in more detail than those organised at the formal learning environment in the midst of learning disruption and pressures. Other benefits of training at the industry level are availability of more time for trainees, a relaxed atmosphere for learning, a better method of attracting trainees' attention, and it helps in the improvement of trainees' morale.

Generally, learning institutions time and again would prefer the off-campus training technique to promote skills development in order to minimise the impact of challenges that are associated with real work settings. A teacher mentoring a student would naturally hold the view that his or her style of carrying out a job is the most suitable which may not be the case (Cole, 2002). In view of that off campus training minimises these challenges. In recent years, greater importance has been placed on training at the industry level as a means of supporting those provided by learning institutions (National Employment Commission, 2004).

People have favoured styles of learning and may therefore tend to learn in different ways (Chambers, 2005). As Brown and McCracken (2009) opined, trainees have different characteristics, including ability, skills, personality and motivation which should be considered when deciding on what method to use in training. Kauffeld and Willenbrock (2010) confirmed that the differences in the trainees' education, experience, levels of skills



and capabilities, and other qualifications are factors that can affect the success of training, and should be considered in the design and implementation of training.

Tracey and Tews (2005) argued that student's level of motivation for the training could affect his or her preparation for the programme. Communicating effectively to students and actively involving them in relevant aspects of the programme could assist them make adjustments in their behaviour and gain insight into the changes required (Burke, Sarpy, Smith-Crowe, Chan-Serafin, and Salvador, 2006). Anane (2013) emphasised that the lecture method employed in Ghanaian training institutions are limited in scope and lack the capacity to assist learners to fully utilise their potentials. He added that other approaches such as case studies, role playing exercises, games and simulation which are more effective are rarely used in the learning environment.

Ghosh, Satyawadi, Joshi, Ranjan, and Singh (2012) observed that, the trainer has the responsibility to motivate the trainees to contribute to discussions by adopting the most suitable approach. Cole (2002) stressed that case studies and simulations are useful training tools that should be employed effectively to enhance skills acquisition. Schraeder (2009) added that training programmes could be designed to accommodate flexible inputs by trainees, and allow for greater degree of participation in the programme. Lucas (2005) also observed that employees are always comfortable performing tasks using traditional methods instead of new ones which are perceived to be risky and problematic. Addy (2008) indicated that most trainers/lecturers in Ghana have limited or no capacity in cutting-edge training methods to provide the needed industry knowledge and skills.



## **2.5 Learning Facilities and CBT**

In conducting training, facilities and equipment are part of inputs and play a crucial role towards the success of the whole exercise. Kirkpatrick and Kirkpatrick (2006) suggested that selection of suitable facilities, and preparation of relevant audio-visual aids are vital issues to be considered when planning to undertake training. They confirmed that audiovisual aids are extensively used in training programmes and are meant to support trainers interact with their audience, to sustain their interest, and to develop a positive environment for learning.

Facilities could vary in terms of size, place, time and other resources needed depending upon the type of training required. This could range from a small, temporary area to large lecture rooms, small conference rooms and advanced instructional technology (Treven, 2003). Yaghi (2008) indicated that the learning aids used for the presentation should be simple to design, easy to understand and use, and more economical in terms of cost. Facilities should be comfortable and convenient. Those facilities that are too small, noisy, and have unsuitable furniture should be avoided. Places that have the potential for distractions, inappropriate temperature as well as venues that would require long distance travels should not be considered (Bimptos and Petridou, 2012). Storr and Hurst (2001) also indicated that the right facilities and resources, learning space, classrooms, and other learning resources that are required for good training should be functional and comfortable.

Brown and McCracken (2009) posited that perceived absence of opportunity to learn and physical logistical constraints could impact negatively on learning. Kirkpatrick and



Kirkpatrick (2006) added that the absence of appropriate facilities might affect the motivation of learners. Charney and Conway (2005) asserted that the instructors should inspect the training location and rearrange the place to suit the occasion. In this regard, training institutions must provide an atmosphere that assists the training process.

Competency-Based Training largely depends on learning facilities in developing students' potential abilities, which focuses on outcomes of learning (Leili *et al.*, 2013). In Tamale Polytechnic, it therefore imperative to say that the provision of learning support facilities such as library, machines, simulation centres, workshops, farm-fields, and computer laboratories are critical in assisting students acquire the desired competencies (NUFFIC, 2004). These support facilities are employed to enhance the learners understanding and skills development in the competencies required. Some authors have recommended the effective use of learning facilities in CBT as a good strategy for the delivery of curriculum since they have some positive effects on students' knowledge acquisition (Aggarwal, Grantcharov, Moorthy, Hance, Darzi, 2006).

The use of workshops for practical activities in CBT assist learners practice the techniques spontaneously, while reducing the possible errors, standards are better respected and procedures improved (Gobbi *et al.*, 2004). Various studies have reported the useful effect of Competency-Based Training curriculum on different fields (Enriquez, 2010). These learning facilities are essential in developing skills and the application of theoretical knowledge (Hansen, 2006), create opportunities for team skills training (Windsor, 2009), and offer a non-threatening environment for unskilled students to reduce their probable





mistakes (Rutledge, Barham, Wiles, Benjamin, Eaton, and Palmer, 2008). The fundamental premise of Competency-Based Training is that students must have adequate time to practice opportunities to acquire and demonstrate requisite knowledge and skills. This can only be achieved if the right learning facilities are provided.

CBT creates and promotes independent and self-directed learning using existing suitable learning facilities (Green, McIntosh, and Vignoles, 1999). Students must receive practice learning opportunities in high-quality learning environments, preferably where effective practice can be modeled by highly qualified lecturers (OECD, 2009). A wide variety of settings may be necessary in order to provide all students the individual learning opportunities that they require. This may assist students of various occupations seeking similar experiences in a simultaneous timeframe to acquire the needed competencies. Several systematic reviews offer support for the value of using two or more facilities in academic settings, to increase understanding of learners complementary skills and contributions (Cook, Grothaus, Gutierrez, Kehoe, and Valentin, 2010). Some studies have demonstrated that appropriate learning facilities have positive effects on students' outcomes (Heitor, 2005).

## **2.6 Lecturers' Demographics and CBT**

In general, several stakeholders contribute to the process of CBT including lecturers. They are key in all phases of the training process. As a result, Bennett and Leduchowicz (2007) indicated that there should be more contact between lecturers and students' to ensure CBT success. Bates and Holton (2007) opined that many factors such as intrinsic and extrinsic



rewards, training design, trainee's readiness, social support, training transfer, training environment, and teacher's attributes may influence the students' attitudes towards the CBT programme. To this end, selection of lecturers is an important component of the training process since the success or failure of the programme largely depends on them. Kirkpatrick and Kirkpatrick (2006) indicated that the trainers' qualities should include sound knowledge in the training area, a good listener, a desire to train, good communication skills, and excellent talent to motivate trainees to participate in the training process. They suggested two methods for effective selection of trainers: watching the trainer's performance in a comparable situation and depending on the endorsements of other professionals who have worked with the trainer. Gauld and Miller (2004) confirmed that trainers can be selected for their listening and questioning skills, communication skills, knowledge of content, problem-solving skills, and ability and readiness to use training aids. Massey (2003) added that training standards requires that trainers should have the ability to know how they can transfer skills and knowledge to the trainee.

A trainer who has passion for the job and can effectively communicate would positively influence the quality of a training programme (Farrant, Cohen, and Burge, 2008). Lawson (2006) observed that the trainer's physical presence in terms of appearance, lecturing, and his ability to communicate could affect trainees' perceptions of the training, and this could inspire them to maximise their job-related skills and knowledge. Therefore, planning the training activity and setting training aims and objectives are among the core activities of trainers. Chen and Chen (2006) confirmed that based on their background and experience, trainers clearly know what is expected of them. Further, Ghosh *et al.*, (2012) intimated that



the trainer must motivate the participants to contribute to discussion, and must adopt useful strategies to inspire group involvement. Brown and McCracken (2009) indicated that trainers can inspire trainees to participate in effective training activities. Yaghi (2008) contended that having trainers from diverse institutions and backgrounds is the best strategy in managing the training process and in ensuring the availability of trainers all the time, in a professional manner, and at the right cost.

In recent years, there has been a body of solid research regarding the relationship between lecturers' subject knowledge and their capacity to deliver. Studies conducted in the United States of America for instance claim that American lecturers lack essential content knowledge for lecturing mathematics (Ma, 1999). It has been well documented that lecturers' content knowledge is important for lecturing (Hill, Schilling, and Ball, 2004; Rowland, Huckstep, and Thwaites, 2005; Davis and Simmt, 2006), and the subject-matter knowledge grows through lecturing. Flawn (2008) argued that, poor lecturers' content knowledge negatively affects student academic performances in a report to the United States National Mathematics Advisory Panel. Therefore, students' success in a particular discipline largely depends on the subject content knowledge of the teacher (Tchoshanov, Lesser, and Salazar, 2008). Under the CBT, the content knowledge of the various lecturers could have positive or negative impact on students understanding and application of concepts taught.

Akyuz and Berberoglu, (2010) stressed that the personality, lecturing practice and behaviour of the teacher forms the core element of the students' classroom experience.



Therefore, lecturers are reported to play a substantial role in student's performance, and broad empirical evidence has found that poor students achieve more under the instruction of highly skilled educators (Rockoff, 2004). Beyond the different levels of academic qualification, various elements of classroom practice are proven to support effective lecturing and learning, such as small-group instruction, independent class work and communication with the parents (Taylor and Clemans, 2000).

The hiring and retention of skillful lecturers is essential for effective transfer of knowledge and skills from lecturers to students (Frank and Danoff, 2010). Studies have indicated that a teacher must be equally skilled as both a classroom teacher and a mentor who has the capacity to guide the learning process of students. The role of the teacher has been particularly well explored, and studies confirm the need for them to develop skills in lecturing, identification of student learning needs, assessment of student learning, prioritizing and time management (Williams and Beattie, 2008).

The findings from studies examining the influence of lecturers' characteristics on various training outcomes, however, call into question what role if any lecturers' characteristics play. Characteristics such as age, academic qualification, and years of experience play important roles in identifying lecturers who are best suited to adopt Competency-Based Training, and may also impact outcomes (Herschell *et al.*, 2010). Some researchers have found that lecturers with higher academic qualifications had more knowledge on CBT than their counterparts, and also held more positive attitudes towards it (Ashcraft, Foster, Lowery, Henggeler, Chapman, and Rowland, 2011; and Nakamura, Higa-McMillan,



Okamura, and Shimabukuro, 2011). Also, lecturers with more experience are less likely to engage in CBT programmes (Stewart, Chambless, and Baron, 2012), while those with less experience were more likely to use CBT in session (Brookman-Fraze, Haine, Baker-Ericzen, Zoffness, and Garland 2010). From literature, lecturers training, experience, and discipline have been shown to impact outcomes in some studies (Beutler, Malik, Alimohamed, Harwood, Talebi, and Noble, 2004), whereas Wampold and Brown (2005) found that these factors accounted for little variability in outcome.

Garland, Haine, and Boxmeyer, (2007) in their study observed that lecturers years of experience were found to be associated with satisfactory delivery of their training sessions, whereas Michael, Huelsman, and Crowley, (2005) found that age and training level did not differentially predict outcomes. Trainers with favourable attitudes towards training manuals self-reported more frequent use of skills in one study (Kolko, Cohen, Mannarino, Baumann, and Knudsen, 2009); while those with negative view of manuals reported less usage of those skills (Ashcraft *et al.*, 2011). Lecturers are more likely to implement CBT when they are consistent with their own theoretical orientation (Brookman-Fraze *et al.*, 2010).

It is extremely difficult if not impossible to determine what actually constitutes a suitable instructional delivery technique and the appropriate tools that can be used to assess and develop it (Peng, Chuang, Hwang, Chu, Wu, Huang, 2009). However, recent studies reported that there are three lecturing elements that could have positive impact on the attainment of learning goals which are professional competence and attitudes of the



teacher, classroom management skills and the learning environment of the school (OECD, 2012).

It is evident that the success of CBT largely depends on the quality of lecturing. CBT is based on the principle that every learner has the capacity to understand what is being taught provided they receive high quality instruction at the right time (Smith, 2010). In self-regulated learning, instructors as information-providers play the role of facilitators, coaches, assessors, educational resource persons (Seezink, 2009). Therefore, learners would be provided with speedy feedback, timely and periodic reassurances, and continual support in all relevant phases in the learning process to enable them attain the desired goals (NCTVET, 2006).

Hattie and Timperley (2007) in their study reported that learning feedback could be provided on the task being learnt, the processes employed to undertake the task, and self-pacing which can take the form of compliments, grades or praises. The learner in this instance is responsible for the progress of the learning and would have to be actively involved in self-monitoring, self-evaluation, self-assessment and self-lecturing to ensure its success (Hattie, 2009). However, lecturers do not always have sufficient time to cover all aspects of the content in the CBT modules and this makes it difficult for them to give students the opportunity for re-submission of task, feedback and coaching (Boahin and Hofman, 2012). Feedback from assessment is essential for effective skill training and expertise development. It is absolutely essential for lecturers to reflect on the nature of



feedback, the timing, and how students would use to develop attitudes that are positive for skills training.

## **2.7 Students' Demographics and CBT**

Effective training programmes must take into consideration participants' characteristics, the available resources, training objectives, and the current levels of knowledge regarding the training process (Brown and McCracken, 2009). There are differences in the trainees' education, experience, levels of skills and capabilities, and other factors that could affect the success of CBT programmes (Yiu and Saner 2005). These differences must be considered during the design stage in order to make the programme a success (Kauffeld and Willenbrock, 2010). Chambers (2005) added that some participants may like to learn differently using favoured styles of learning and these should be noticed and incorporated. Schraeder (2009) suggested that learning could be enriched by using flexible design, especially of content, where the areas to be learnt would meet the requirements and interests of participants.

Chiaburu and Tekleab (2005) submitted that trainees with sufficient backing from their supervisors generally attend training sessions with a stronger belief in the programmes effectiveness and this could help them complete it and gain the best out of the training. Lingham, Richley, and Rezania, (2006) in their findings stated that lack of organisational support and employee participation in decision-making about training and self-development could lead to reluctance on employees' part to participate. As a result, trainees



who consider training as irrelevant to the job could devote less effort in acquiring the skills and knowledge required by the job.

Suffice it to say that a host of recent related studies have tended to show mature-age students achieving better academic grades than their younger counterparts (Van Jansen, and Lyles, 2008), which have similar characteristics with Competency-Based Training. Sheard (2009) presented that matured students achieved greater academic success, as measured by final degree GPA, compared to younger ones. McKenzie and Gow, (2004) also posited that matured students have performed creditably and are reported to have obtained considerably more first Class and upper second class degrees than younger students.

Suggested factors that might have contributed to this finding include the higher levels of achievement motivation, willingness to work, persistence, critical reflection, internal locus of control and self-efficacy (McKenzie and Gow, 2004) of older students. Another explanation for this may be due to matured students' perception of their present situation as a last chance and often see education as a catalyst for change in their lives and feel a tremendous pressure to succeed (Shanahan, 2006). Besides, matured students have greater level of confidence due to their experience of life, the world of work and that appears to distinguish them from their younger counterparts. Ofori (2000) opined that matured students are sufficiently assertive and are always keen in establishing one-to-one contacts or discussions with lecturers and tutors, thus fostering a deep approach to learning. Matured students in contrast to younger ones, work out the meaning of information for themselves.





Matured students do not accept ideas without critical examination, and relate ideas from their studies to a wider context. They look for reasons, justification, and logic behind ideas (Sadler-Smith, 1996).

Gender is another important demographic variable that appears to differentiate students in terms of their academic achievement. There is an increasing evidence that female students are outperforming their male counterparts (HEA, 2004). Research has shown that female undergraduates grade point average (GPA) are higher than that achieved by male students after the first year of study (Strahan, 2003), and across three years of undergraduate study (Woodfield, Jessop, and McMillan, 2006). Female students appear to adapt more easily to the contemporary higher education's discourses and accepted learning behaviours (Smith, 2004). They are generally more motivated towards and to readily engage with academic goals and activities (Baker, 2003). Females display a more self-determined motivational profile and adhere to study schedules (Hofman and Van den Berg, 2000). Much of the extant literature appears to be in agreement that female students work harder and more consistently and that accounts for their good performance (Woodfield *et al.*, 2006).

In other studies, however, older age and gender did not significantly contribute to academic performance of students (Grumbach and Chen, 2006). Similarly, other studies indicated that there is no significant difference between male and female in their perceived ICT competencies among students in tertiary institutions as gender gap has narrowed significantly in tertiary institutions (Ozoemelen, 2010). In another study, Rajagopal and Bojin's (2003) stated that there were gender differences among male and female college



and university students. Research by Meelissen (2005) showed that girls seem to have a lower self-efficacy compared to boys especially in more complicated tasks. TengkuFaekah (2005) also indicated that male students have higher perceived ICT competency than their female counterparts.

Igbinedion (2011) reported that there was a significant relationship between parents' occupation and a student's career choice. The impact of parents' role in the career choice of the children is that it could lead to student progress in terms of attendance, more positive attitudes, better grades, increased motivation, and higher test scores (Gentry, 2013). It also fosters positive attitudes towards school, improves homework habits, reduces absenteeism and dropping out, and enhances academic achievement (Smith, 2010). Allen and Cowdery (2009) provided that parents are the major socializing agents for their children and therefore transmitters of cultural values, beliefs, and traditions which are central to a child's choice of career. The implication is that most students may be pursuing the programme because of their earlier exposure to the practical aspect of it and parental influence.

From the literature, it appears that the evidence for specific gender differences in competencies is inconclusive although there is a widespread belief that certain competencies are male-dominated. It would, therefore, be interesting to establish whether gender and age affect the perceived competencies of Agricultural Engineering students in Tamale Polytechnic for which this study is being conducted since CBT is seen as not only crucial for the lecturing and learning process but also for professional advancement.



## 2.8 Assessment of CBT

Since the development of competence and new competencies are understood to be ongoing activities, officialising competency in a qualification or statement of achievement is a point-in-time decision. The bottom-line is that one is either competent or not yet competent in the CBT assessment. Nevertheless, one fundamental concern from studies spanning over a decade is whether the recognition of expertise, excellence and CBT are compatible (Torr, 2008).

Galt, Parr, and Jagannath (2012) opined that competence and judgements about it need to be supported by relevant adequate documentary evidence. This is not only required to support better recognition of prior learning, but it also ensures that evidence of competence is collected, organised and documented from a variety of sources. There is growing support for the use of collections to facilitate this process. As noted by Kolb and Kolb, (2005), CBT is an experiential learning programme and its assessment need to be authentic. Cumming and Maxwell, (1999) posited that authentic assessment underpins the concept of Competency-Based Training which is directly linked to performance of tasks undertaken in the world of work. It requires the physical presence of assessors' to supervise the entire activity, not just the final product or isolated elements of it (Oledele *et al.*, 2011). Wiggins, (1990), noted that assessment is deemed authentic when students' performances are directly assessed whiles they are undertaking a defined task. Bennett and Leduchowicz (2007) indicated that there should be more contact between trainers and trainees' to ensure its success.



In Tamale Polytechnic, competence is assessed through the process of comparing skills acquired relative to the established standards of performance required (Gonczi and Argüelles, 2000). The assessment fundamentally centres on prescribed knowledge, skills and attitudes to be acquired as a result of training received and it may be conducted either in a real or simulated environment. It is key in CBT because it helps in determining the difference between the existing level of performance and the prescribed learning outcomes. Assessment provides feedback from learning activities and could offer lecturers the opportunity to vary instructional methods for learners to better understand. It also assist students to self-regulate their learning to attain mastery of the desired competences (Harlen and Crick, 2003).

Assessment is at the core of students' learning using the CBT and Rust (2002) suggested that it defines the curriculum from the students' point of view. However, despite the increased recognition of assessment as part of an aligned curriculum to support student learning (Biggs and Tang 2007; Boud and Falchikov 2006), Bryan and Clegg (2006) stated that the focus of much of this assessment is on testing knowledge and comprehension and ignores the challenge of developing and assessing judgments. Falchikov and Thompson (2008) revealed that the traditional methods relied on a limited number of techniques such as closed book examinations and essay-type assessments, which focused primarily on summative assessment have been found to be unsuitable for developing these desired graduate skills. The gap between the intentions of lecturing academics and their assessment strategies reinforces questions raised by Arum and Roska (2010) about whether higher order learning is taking place at all, or whether it is simply not assessed.



This research observed that CBT as practised in the Agricultural Engineering Department in Tamale Polytechnic, an assessor could be either a lecturer, external expert, the learner himself or peers. During assessment, the assessor assesses the account rendered by the student and the judgement would be based on either direct observation, interviews, opinion of third parties, data gathered by student or product made by the student. The assessor then provides a feedback to the student based on the assessment.

Again in Tamale Polytechnic, the practical component of the assessment is made up of 60% of the total marks in the final grade of a student and this consists of Departmental practicals, field and project work. The theoretical component is 40% of the total marks in the final grade of the student. Out of this figure, 10% is obtained from mid-semesters, 10% from assignments, while the remaining 20% is obtained from end of semester examinations (NABPTEX, 2007). Students' performances are assessed using benchmarks such as attendance, participation, teamwork, assignments, research work, quizzes and presentations. The practical aspect of the programme is assessed based on the demonstration of specific skills, and this could be undertaken either at the work environment, or by use of simulations. Students are assessed as either 'competent' or 'not yet competent' relative to the competency standards required by the professional task. For a student to be judged competent, he/she is required to pass both the practical and theoretical assessment, 30% marks in practicals and 20% marks in theory.

However, Smith (2010) posited that assessing learners against pre-defined criteria has the potential to limit the judgment of the assessor on competencies outside the prescribed ones,



yet relevant for innovation and subsequent operations at the workplace. It is therefore apparent that effective and time tested skills cannot be assessed by using the modular approach which determines ones competency level at the end of each module, but this requires reliable feedback from multiple sources over a reasonable period of time (Guthrie, 2009). Competencies therefore, could be assessed based on a person's ability to demonstrate skills, understand the essential principles and its effective application at the work setting. The assessment process is also seen as being too labour intensive and time consuming because of its over-reliance on structured observations, check-lists and rating scales (Hellwig, 2006). It is against these concerns that lecturers and industry supervisors need to acquire high-level skills and qualifications for effective delivery of CBT (Smith, 2010).

## **2.9 Grading System for CBT**

One fundamental concern from studies spanning over a decade is whether the recognition of expertise, excellence and CBT are compatible (Torr, 2008). 'Grading' as an instrument of acknowledging excellence or expertise has been a disputed issue ever since the Competency-Based Training was introduced, and there is an ongoing debate about its ability to measure ones performance. Grading is a tool many people find valuable, more especially training institutions, students, employers or lecturers. Williams and Bateman (2003) posited that training institutions could use grading for award purposes, whilst other learning institutions like the polytechnics could use it in their selection process.



A grade is basically a symbolic depiction of the level of success achieved by a trainee or a student. Traditionally, the symbols for grades are usually alphanumeric characters or short descriptors in the form of Distinction, Merit, Credit or Pass. Grades are expected to represent the extent to which they commensurate with students' academic achievement in terms of quality, breadth and depth. They are a reflection of the actual level of achievement and what the assigned grade is assumed to stand for as determined by an assessor. Grades need to have integrity and that has to do with their authenticity and provenance rather than their utility for various purposes although logically, any improvement in grade integrity should lead to an improvement in hands-on utility (Sadler, 2009).

Students on the CBT programme in the Polytechnic are graded using the criterion reference system where they are judged either competent or not yet competent. With criterion-referenced grading, a learner's achievement is measured relative to defined standards that are based on a range of knowledge acquired from no expertise to desired performance. A student's achievement level lies at a point on this continuum resulting from performance where learners are awarded grades that are independent of others. Criterion-referenced grading could be employed when a trainer or lecturer wants to measure students' performance against specified standards and not against each other's achievements. It is also appropriate to select individuals who can perform a given task at a certain level of competence.

Criterion-referenced grading is especially useful when public safety or other considerations demand that certain tasks be performed only by those who are fully qualified (Hammons



and Barnsley, 1992). This approach assists assessors determine what students have learned, not how they are positioned when compared with others. The criterion-referenced grading can help ensure success in subsequent units by screening out learners who have not mastered the content of prerequisite units in courses with cumulatively sequenced content. The grading is also well suited to classes with significant numbers of high or low achievers, because grade distribution would not be affected. Finally, it has the capacity to motivate students, because there are no predetermined limits on the number of students who can earn high grades since it is possible for all students to earn grade 'As'.

The criterion reference grading could be less familiar to some assessors, and this would require volumes of explanation, defense, and training in establishing defined criterion levels. Use of this grading system could result in high grades for all the students in a class, or, if none performs up to the pre-defined criterion levels, all of them could fail, irrespective of the quality of instruction. If all students perform well, the system would not eliminate a certain percentage of performing students, as is usually the case in norm-referenced grading system. A major challenge assessors may face using this approach is how to establish and defend the criterion levels for A, B, C, D, and F (Hammons and Barnsley, 1992).

The opposite of the criterion reference grading system is the norm reference grading. Essentially, norm-referenced grading compares students performances to one another to ascertain each student's comparative position within a given class or group of them. With this type of grading, the meaning of any one score is derived from a comparison with other scores in the norm group (Hammons and Barnsley, 1992). This form of grading is also





called the “curve,” because it encourages the concept of normal distribution in which there is a small number of both excellent and poor ones, with a large group in between. Such a practice lends itself well to assigning letter grades. Norm-referenced grading system is appropriate when discriminations among students or trainees must be made. Fixed quotas are always required in the selection of applicants for further studies or for gainful employment.

This system of grading is extensively used and accepted and therefore requires minimum explanation or training for lecturers and students to understand. However, the norm-referenced grading system creates a comparative standard that depends on the performance of each group. The system describes whether a student is more or less proficient than another but not how proficient that student is relative to the material covered. It basically assesses student status, not learning. It creates the impression of a standard by which students can be assessed equitably. The system creates a self-fulfilling prophecy that a few students will be high achievers, many will do moderately well, and some will fail (Hammons and Barnsley, 1992).

A score of 50 and above comprising both practicals and theory is the minimum mark a student should score in order to be judged ‘competent’, and anything less than that is considered ‘not yet competent’. In all this, the student is expected to score up to 50% in both the practicals and theory which are expected to contribute 60% and 40% respectively towards the final grade. If a student is unable to score up to half in any of them, that student



would still be considered to be ‘not yet competent’ until such a time that he is able to garner such marks that would move him into the region of ‘competence’.

## **2.10 Rationale for CBT Programme**

Several countries around the world have had decades of experience using CBT to develop the skills needs of their industries. At the core of this shift to CBT is the increasing concern and frustration over the effectiveness of the traditional curricula of educational programmes to the world of work. There was an expressed belief that academic institutions offer programmes that often underscore theoretical knowledge to the detriment of those that are needed to carry out tasks at the workplace. Boahin (2013) reported that the change from the traditional method to CBT is necessitated by economic conditions and the need to review and reform the theory-oriented old curricula.

Boreham, (2002) contended that, programmes on vocational education and training in the United Kingdom for instance focused more on acquiring knowledge and theory at the expense of performance. Equally, Keating (2008) indicated that CBT was viewed as the basis for reform in vocational education and a means of scaling up skill levels and productivity in Australia. Similarly, Carter (2005) reported that vocational curriculum in the United States placed more emphasis on theoretical knowledge to the neglect of practical undertakings which led to over-dependence on certificates as a major standard for engaging prospective workers. Furthermore, ECDVT (2010) stated that course contents in the Netherlands was largely theory-centred and could not adequately prepare the youth to fit into the world of work. Moreover, Allais (2010) submitted that Outcome Based



Education (OBE), an alternative to CBT was introduced in South Africa to offer skills training to prospective workers so as to help minimise the level of joblessness among the unemployed and to achieve economic growth and development.

Winterton, Delamare Le-Deist, and Stringfellow, (2005) reported that the origin of CBT can be traced to two main perspectives which are the behaviourist dimension as used in the USA, UK and Australia, and the holistic dimension as practised in France, Germany, Netherlands and Austria. Chappell, Gonczi, and Hager (1995) reported that the behaviouristic dimension of competence became popular in the USA in the 1960s where it was associated with performance-based teacher training which was branded as competency-based education. CBT was the idea of educational philosopher Ralph Tyler (1902-94) who supported the inclusion of behavioural objectives into the preparation of curriculum and lecturing which had components, of performance, standards, and conditions. It was suggested that learning programmes should be evaluated to ascertain changes that may occur in learner's behaviour as a result of the training.

As Murray (2009 ) submitted, learners could attain mastery of recommended competencies at their own speed while students' performances are assessed using criterion-referenced method. The behaviourist explains CBT in a narrowly focused and job-specific way. Emphasis is placed on what the learner can execute, while less importance is attached to foundation knowledge, values, attributes, meaning, intention and the consequences of personal and ethical concerns.



On the contrary, the Holistic approach considers CBT in a wider perspective and incorporates individual abilities, ethical and cultural standards in the training programme. This perspective believes competence is situation-specific in conjunction with behavioural, cognitive and ethical elements. Training delivery and assessment practices under the holistic approach must be related and should be organised in a suitable simulated or working environment. However, the desires of this rapidly changing business environment cannot be sufficiently addressed by narrowly prescribing skills training which disregard relevant parts of general education. Education is meant to train individuals for life, and this should not limit learners to only one job or responsibility, but should equip them with the know-how to fit into society (Boahin, 2013). Similarly, based on the behaviouristic approach, certain services that demand attitudinal changes stand the chance of being relegated to the background since certain ideals and well-intentioned standards reinforce certain professions.

From the above discourse, it is quite apparent that competence as a concept is experiencing an on-going process of continuous change for the generation of varied thoughts and models. Harris (2006) posited that this could be attributed to changes in technology, organisational restructuring and labour market demands. Competence is largely regarded as the application of knowledge, skills, personal attributes and attitudes to carry out a particular task to specific standards. Indeed, competence is a journey as well as context-reliant. It goes beyond prescribed education and training and incorporates all life experiences which have been acquired over a period of time. Therefore, CBT must be approached in an integrated manner in order to derive the benefits of other equally



important learning methods. Equally, competency models need to offer wider perspectives of competency criteria in order to create different paths and identify the significance of a persons' prior knowledge in varied situations (Mulder, Weigel, and Collins, 2006).

In Ghana, polytechnics were established to provide career-oriented training, and to conduct real-world research in partnership with industry (Amankwah, 2011). Nonetheless, JICA (2001) reported that the core curriculum of the HND in the Ghanaian Polytechnics are more theory-focused system of assessment. Another report by the National Council on Tertiary Education which was labelled as Technical Committee on Polytechnic Education (NCTE, 2011) also revealed that NABPTEX, as the examining body for the Polytechnics in Ghana, lacked the needed capacity for the assessment of skills, competencies, aptitudes and practical training in HND examinations. In effect, with no evidence of practical assessments, the HND certificates that are awarded by NABPTEX are only based on theory.

Furthermore, a tracer study conducted by Boahin and Hofman (2012) on the performance of polytechnic graduates in Ghana highlighted skills shortages in some specific study programmes. Job-specific competencies are crucial in Ghana because feedback from employers' surveys shows that tertiary graduates are weak in professional competencies such as problem-solving, organisational skills, ICT, communication and teamwork (World Bank, 2009). Also, Barrie (2005) stated that lecturers do not incorporate these competencies into learning and assessment approaches.



CBT has the potential of improving skills level of employees and creating a competitive advantage for an organisation (Schuler and Jackson, 2006). In the face of rapid and uncertain changes around the world, organisations are constantly confronted with the need to develop demand-driven training programmes for their workforce to enable them compete and succeed in today's unpredictable business world (Lingham, Richley, and Rezania, 2006). In the same way, Lin, Chen, and Chiu, (2010) contended that organisations are increasingly realising the contribution training makes to the overall performance of their employees. A number of reasons account for this which could be technological, universal competition, constant innovation, intellectual capital, to stay competitive, aging workforce; and continuous investment in manpower to help them stay competitive in practice (Tai, 2006). Undeniably, training and lifelong learning has become more relevant for all countries and organisations, because of the inability of formal education to adequately ensure continuous development of human resources and intellectual capital. Boits (2004) posited that training institutions need to provide continuing efficient services to assist employees deal with the fast changing world. Aghila (2000) also reported that low satisfaction among employees is caused by poor benefits, training, and progression.

Leader (2003) attributed the need for training to economic reasons, and that there are no compelling reasons apart from its economic value. The need for organisational and technological improvement have ever more led employers to the realisation that success hinges on the knowledge, abilities and skills of their workforce (Yaghi, 2008). Consequently, organisations are continuously investing in the development and training of their human resources since it is considered as a value-added practice (Stavrou-Costa,



2005). It is apparent that training is important for both organisations and workers. The need for training is as a result of the organisations' quest to meet the demands of global competition and new innovation (Noe, 2005). As supported by (Holton and Naquin, 2003) to increase production and profitability, employees need to constantly acquire up to date knowledge that would be relevant to their operations both for the present and the future.

Workers are increasingly seeking to improve their skills to make them competitive for future career prospects, and this has made them to be concerned about the pace of obsolescence of knowledge and skills they have (Chen, Chang, and Yeh, 2004). With this, training institutions have to use their programmes to develop their students' skills and knowledge, a situation that should also improve their career paths. Largely, it is noticed that the training of employees is often seen as the basis of productivity improvement in business and used to justify training expenditure (Bartlett and Kang, 2004). It is believed that there is a positive relationship between employees development and training and organisational efficiency (Holton and Naquin, 2003), since it enables workers to achieve more and consequently perform better. Jacob and Washington (2003) observed that productivity is improved as a result of a firm's investment in training activities. Therefore, there is ample proof that training courses for workers have reasonable relationship to organisational achievement.

Rowden and Conine (2005) submitted that training could be used as an instrument to increase job satisfaction. Tsai, Yen, Huang, and Huang, (2007) reported that workers who are committed to learn have a higher level of job satisfaction and as a result their performance on the job. Hence, workers who recognise their training to be relevant will be



more satisfied than those who think otherwise. Workers trained would have the skills to better fulfil the desires of their customers. Those workers who feel less skilled to perform their job could desert the organisation (Chen *et al.*, 2004). However, if such workers decide to continue, their performance could be sub-optimal (Kanelopoulos and Akrivos, 2006). Consequently, the wider the skills gap between what is needed and those possessed by the workers, the more the presence of job dissatisfaction which could lead to higher turnover rates.

CBT received could assist workers to minimise work related frustrations and help address deficiencies in skills required to successfully perform tasks. Holton and Baldwin (2003) reported a link between benefits and training outcomes and that those who expect their benefits to increase following the training would also show improved performance. Training activities increase organisations' ability to increase productivity, improve service, and implement new technology. By providing training opportunities, they support employees to develop their individual competitive advantage and guarantee their long-term job fitness and employability skills (Schuler and Jackson, 2006). The importance attached to training by employees is often demonstrated by their frequent demands to employers to provide them with all the training they need to carry out both current and future tasks. Powell and Yalcin (2010) claimed that the unstable nature of business environment justifies the need for organisations to strengthen their competitiveness as well as develop effective human resource base, hence the attention to training and development.





The caliber of workforce determines how an organisation can sustain its level of performance. Yiu and Saner (2005) admitted that competitive advantages have been eroded by aggressive competition, and it now depends on superior innovation, and intellectual capital which in turn require sophisticated skills and knowledge that can only be got through training to help increase the organisation's performance. It is imperative that organisations facing stiff global competition should constantly develop their workers knowledge, skills, abilities and attitudes (Kauffeld and Willenbrock, 2010). Rowden and Conine (2005) presented that training is a device meant to increase job satisfaction and to meet customers' needs in superior ways.

Redman and Wilkinson (2009) admitted that training has a positive impact on the quality of organisations' products and its bearing on performance and profitability is significant. The rewards of training are multi-dimensional and consist of talent, scientific and technical, financial and social benefits. The main objective of training is to produce productive workforce by equipping them with skills, knowledge and competencies required to meet present and future needs (Armstrong, 2003). Properly trained workforce could reduce operating expenditure, enhance productivity, and improve creativity. Holton and Baldwin (2003) however stated that the main aim of training is to increase trainees' performance by transferring the skills learned to the work-setting. Organisations that make sustained efforts in developing their human capital perform better than those that pay attention to it (Lyons, 2009). Pattni and Soutar (2009) declared that training plays a vital part in increasing workers' self-efficacy.



### 2.11.0 Competency Models

Competency models are decision making tools which describe the core abilities required to execute a given job (McLagan, 1980). These models provide many benefits to their users. They could be instrumental in the design of job descriptions for specific positions within an organisation (Tas *et al.*, 1996), and developing performance benchmarks (Chung-Herrera, Enz, and Lankau, 2003). Competency models could inform hiring managers about the characteristics of the ideal candidate (Brophy and Kiely, 2002) and determine whether an external search is appropriate (Martone, 2003). These models could increase employee empowerment and overall organisational performance in competitive work settings (McHale, 1995; McLagan, 1997). At individual levels, it could aid employees make decisions about acquiring additional education and experience in a specific area (McLagan, 1980).

Jeffrey (2013) submitted that competency models are divided into two broad categories namely generic and organisationally specific. The generic competency models are those that are intended for all workers or industries, and can be developed by government researchers, academics, and industry. They are broad and provide a foundation for organisations to develop competency models that could satisfy their specific organisational needs. On the other hand, competency models that have the capacity to address specific needs of organisations are referred to as organisation specific. These models are often developed by larger organisations that can afford the resources required to conduct research for the development of a model.



There is an on-going debate in the literature of Competency-Based Training about the value of generic as against organisation specific models. Others authors' argued that the uniqueness of all organisations weakens the value of generic competency models. This is so because, success in one organisation may not automatically translate into success in other organisations because of the degree to which organisations differ (Koenigsfeld, 2007). In this regard, Wills (1993) alluded that generic competency models are not designed to be end products, but they rather serve as starting points for organisations seeking to develop organisation specific models. However, organisation specific competency models are uncommon and may not be published to the outside world since they are regarded as trade secrets by many firms. Thus, generic competency models are those that are in the public domain and may serve as starting point for organisations intending to develop their own comprehensive models.

Competency models may be used to establish specific competencies that could be employed in an organisation to enhance workers performances (Rothwell and Lindholm, 1999). Lado and Wilson (1994) identified two different methods for measuring competencies: Input-Based and Output-Based. Input-based models measure competency as knowledge, skills, abilities, or attitudes that an organisation must acquire from external sources to maximise organisational output. Input-Based models inform human resource hiring process which may eventually lead to acquisition of qualified personnel. On the contrary, output-based models seek to develop competencies within the organisation. They focus on changing demands in the organisation's external environment and take steps to modify the internal environment so as to maximise returns. These models seek to appraise



outcomes of training and development programmes to ascertain whether the acquisition of new competencies impacts organisation productivity.

Although the selection and training of students to fit into the world of work is widely recognised as one of industry's most pressing problems, there is surprisingly little agreement among industry players and training institutions on what makes a good training model. The development of programmes by some of the nation's leading institutions reflect a tremendous variation in training models designs and approaches. At the root of this difference is industry's search for the traits or attributes which will objectively identify the "ideal worker" who is equipped to effectively cope with any problem in any organisation. Thus, the models discussed below are some of the mostly widely used ones in the development of industry desired competencies in workers.

### **2.11.1 Katz's Model**

Though Katz (1955) did not consider his study as a competency model, it is worth noting that the introduction of competency domains in the work has been a significant determinant in works of later researchers towards the development of competency models (Chung-Herrera et al., 2003; Koenigsfeld, 2007; Sandwith, 1993). Katz submitted that specific competencies are required to be classified into closely related categories in competency domains as technical skills, human skills, and conceptual skills. In the words of (1997), for purposes of simplification, competency domains are segmented further into competency domain clusters. An important concepts that relates to Katz' model is the development of workers skills from the bottom up, allowing them to develop their technical



and human skills and then working their way to the conceptual approaches to tasks or projects. If they were once in the field, they can relate far better than someone who has always been a high-ranking person in a company or agency.

### **2.11.2 McClelland's Model**

McClelland's (1973) work on competency model arose as a result of his disagreement to the use of intelligence and aptitude tests as a predictors for success prior to the 1970s. At that time, intelligence and aptitude tests were employed for placement into schools, and employment selection for industry and public service (McClelland, 1973). McClelland contested the validity of intelligence and aptitude tests, and that there was no evidence to support their success determination construct. He contended that by validating one test against another type of test, it implies success in one test predicted success on the other test rather than predicting overall life-outcome success. Success designers at the time sought to design tests that considered stability, where the scores reflect an innate aptitude that is unmodified by experience. McClelland submitted that this construct did not reasonably measure what knowledge or skills people acquired from their experiences.

Therefore, an alternative construct for predicting success in the workplace was recommended. He admonished researchers seeking to develop competency models to first diligently appraise successful workers in a particular position within an organisation to ascertain activities and behaviours that accounted for their success. This process was termed *criterion sampling*. Following this, researchers must make sure that the tests they



employ in measuring competence mirror individual learning. To McClelland, training and experience lead to changes in an individual's level of competence and performance. Tests that are unable to measure changes neglect the personal growth that comes with experience, and may not precisely measure the abilities of individual's to perform in a given job. He also stated that test designers did not disclose the exact principles underlying their tests, as there was disquiet that a person with foreknowledge could defeat the test and obtain a false positive. McClelland objected this concept, and suggested that test that can be defeated may not accurately measure the intended outcome. Instead, he recommended full disclosure of how a candidate can improve performance, thereby his or her ability to succeed on the test.

McClelland's (1973) Competency Model also suggested the concept of competency clusters as a technique of minimising the difficulties involved in testing for competencies. He argued that testing for individual competencies could produce hundreds of variables for every job. This could result to less testing for competency domains made, thereby making competency models reasonably priced for all but less resource endowed organisations (McLagan, 1980). The concept of competency clusters which were earlier proposed by Katz (1955) gained prominence in the work of McClelland. It was suggested that skills required of workers were divided into three broad categories namely, technical skills, human skills, and conceptual skills. These categories were subsequently labelled clusters.



## **2.12 CBT and Traditional Approach to Training**

In general, CBT is considered a superior alternative to the traditional approach to training for several reasons. In CBT, training is divided into learnable units or elements of competence focusing on specific skills development. On the contrary, the traditional method of training is often perceived as being too generic, and does not focus on developing specific skills that seek to address job related issues that could improve performance. CBT is more flexible, not time-bound, and student-centred, where learners progress through modules either independently or in groups at a self-regulated pace. Eggink and Van Den Werf (2006) submitted that the role of the teacher is that of a coach, mentor or facilitator. The traditional approach to training is centred on programme contents, and the learning is defined by time. It is teacher-centred, where he is seen as an expert with large class size and uses lecture-oriented method of instruction.

CBT is a structured programme, practically-centred, and where theory is used to enhance knowledge acquisition conducted at workplaces or in a simulated environment. However, the traditional approach focuses only on the acquisition of large volumes of knowledge, with minimum emphasis on practical activities and this normally takes place in the lecture theatre with all members pursuing that programme. Assessments are conducted using written test and assignments in the traditional method while achievement of students are compared with others taking the same course. Under CBT, assessment is focused on prescribed standards in the industry and the result of the training is determined using criterion-referenced which can either be judged as competent which represents pass, or not yet competent which is a fail.



In CBT, trainees who already possess special skills acquired in previous formal training, work or life experience can receive credits for that or exempted from modules which contain those specific competencies. However, there is no organised system of Recognising Prior Learning (RPL) and that credit for prior learning is open to various interpretations. The traditional system of training is generic in nature, but CBT is tailored to satisfy the skills development needs of an organisation and its employees. CBT allows for a more exact match between training, and industry needs (Cremers, Eggink, and Hoetink, 2005)

Callan and Ashworth (2004) reported that Competency-Based Training, coupled with other relevant initiatives, has brought training institutions and industry closer and there has been shared respect of the value of this by parties involved, particularly through partnership arrangements and skills networks. However, Loble and Williams (2004) opined that a great deal of doubt exists about how well CBT as a concept is understood and applied. Different views abound within and outside the vocational education and training sector of what it means and what it constitutes.

Among providers and academics using CBT model, there is a large measure of support, though there is still some lingering disquiet about it. All the same, there is undoubtedly not a robust or persuasive body of support for any superior alternative to CBT. Thus, what is much needed is a refined approach to CBT which would have the capacity to address some of the challenges with the conception of competence and the way training models and systems operate. It is also about trying to balance the needs of industry and individuals in competence development.





Some studies have made the additional point that CBT is but one of the elements related to the development of a more skilful and adaptable employees. Others cast doubt on whether it is even a major one and lamented about the division brought about by discounting the importance of the relationships between tasks performed in an occupation (Galt, Parr, and Jagannath, 2012). In recent years, Wheelahan (2008) has submitted that one must train or learn beyond work, and stop favouring only the skills needed for work to the detriment of other less instant but potentially significant knowledge which may be of use to the learner.

Similarly, while there is also an increasing practice of expanding assessment to include skills, knowledge, attitudes and ethics to realise more holistic and less fragmented assessments, CBT assessment procedures continue to be in doubt. This is not in doubt as the CBT training models promote assessment-led techniques to lecturing and learning. It therefore stands to reason that the quality of the lecturing can be influenced in part by the strictness or liberally authorized assessment procedures of the training models. It could also be influenced by the elements assessed and certified. There is an ongoing debate that the assessment and certification of both underpinning knowledge and generic, employability skills and attributes are less rigorous. There is also less certainty about the way professional judgements of skilled assessors are valued, especially through the auditing process (Smith, 2009).

There are still concerns by both providers and industry over the standards of what others provide. Industry is particularly sceptical of the standard and quality of training if they have no direct experience of it. There are therefore calls for greater consistency of standards on



the one hand, as well as demands for greater flexibility and for programmes which meet particular needs on the other. It is hard to have both.

### **2.13 Fallouts from the Competency Construct**

Conceptions of competence vary and the way in which they are manifested in various countries differ. However, there appear to be a common set of conclusions emerging in the world of research. Among others, majority of the models capture the version that contains knowledge, skills and personal attributes, and attitudes approach. However, since there are many conceptual definitions of competency, they cannot readily be captured through generic descriptions regardless of the fact that there is over-reliance on standardization of competences. They are effectively dependent on context (Mulder *et al.*, 2007). Conversely, an integrated approach to the competency concept creates the platform for learning techniques such as problem-based curricula, authentic learning methods among others (Torr, 2008). Besides, Figgis (2009) has underscored the relevance of such problem-based and authentic learning methods in lecturing hands-on skills to trainees.

In addition, it could be extremely challenging to integrate institutional and workplace learning since the competency concept does not solve this automatically though both environments may have contributed significantly to competence development. More so, the stress on assessment in competency standards can be uneven and over dependent on the relationship between performance and the implication of competence. Core mechanisms of competence benchmarks need to be known to assist differentiate between



individuals. Nonetheless, the assessment of competence is rigorous and a time-consuming process (Mulder *et al.*, 2007).

Furthermore, knowledge and employability skills may be relegated to the background because there is so much over reliance on competency. In recent times, conceptions of competence focusses so much on the importance of learning-to-learn and ‘personal reflection’ skills. Competence is a journey, not an end point. It goes beyond formal education and training and experience. They are acquired through the integration of all that has been learnt or experienced formally and informally, and in some cases relate to abilities which have been harnessed throughout life. As a result, this could be seen as a credible rationalization for the creation of prospects for grown-ups to learn and acquire skills throughout life.

Galt *et al.*, (2012) posited that all competence models have to accommodate diverse opinions of what competence is, how it develops, changes, grows and matures throughout an individual’s career and life. Hence, a model of competence needs to consider a balance between the job-related needs of industry on one hand and that of the individual on the other hand. An agreement between relevant stakeholders as to what actually constitutes Competency-Based Training could facilitate pathways and recognise the value of an individual’s formal and informal learning in whatever context.

Besides, in a more liberal and competitive vocational education and training system, individuals would be given several alternatives over their purchasing decisions. Under such



situations, the choice is theirs to determine courses that would be suitable for their circumstances, and should not be the preserve of either industry or training institutions to impose programmes on students. In a society where democracy flourishes, the fundamental imperative is the empowerment of individuals to make choices that are suitable to situations (Tarrant, 2000).

There appears to be no comprehensive national policy on who is presently making the decisions to enrol in programmes. If those decisions are being determined and financed by employers to enable their employees to acquire the desired skills, there is no question that functional and employer-relevant training is called for. However, if those decisions are made by individuals, then those training needs are meant to meet individual's personal needs and aspirations and not the needs of industry.

Karmel, Mlotkowski, and Awodeyi, (2008) studied the significance of training to the work of VET graduates using a comparison of what they study and the jobs they do. It was discovered that there was a high level of match for technicians and trades group of occupations, but comparatively low for most other courses. The mismatch between expected and actual occupations reflects the generic aspect of vocational education and training where graduates report that their training has relevance to their jobs, even though they are not at their expected occupation. This highlights the fact that CBT may not have all the answers that can address the needs of the labour market since there is no exact match between courses offered and the occupations in which most people end up working apart



from the trades. Besides, those designing training models need to be conscious of the fact that many graduates may not work in their expected destinations.

The above, therefore, suggests that there is a need to balance conceptions of personal and occupational competence. With individuals, personal competence is the bigger construct, and job-related competence certainly a sub-set. The extent to which an individual's overall competence is used as part of his work-related competence will depend on the workplace context. Certain workplaces and job functions will make use of a range of the available competencies of an individual than others.

#### **2.14.0 Skills, knowledge and Attitudes for Work**

CBT is anchored on three variables namely skills, knowledge and attitudes. These are at the heart of the CBT programme and all trainees under the programme are required to acquire them during their time of study. It is asserted that if trainees are equipped with the right skills, knowledge and attitudes, they would be able to effectively function in the world of work. It is, therefore, appropriate to consider the type of skills, knowledge and attitudes that are required by industry.

#### **2.14.1 The Skills Debate**

In recent times, training and skills acquisition have assumed a central position within the Ghanaian socio-economic discourse and has come to be seen as being capable of addressing a wide range of issues that confront industries, reducing poverty levels and stemming the tide of unemployment in society (Keep, 2012). Across the country, a set of



inter-woven theoretical and policy debates has evolved that suggests that the education and training system has a key role to play in fighting poverty and reducing relative income inequality by empowering lowly-skilled individuals to gain employment who would then progress and succeed in the world of work . Having better skills has been depicted as the most important lever within the control of policy makers to create wealth and to reduce social deprivation (Leitch, 2006). Nothing helps you to get, keep and progress in a job more than having the right skills (LSC, 2006). As Nunn (2008) observed, skills are now “the new welfare”. Employees must learn, unlearn and relearn to adequately prepare themselves and see training as an instrument for earning entry into and enjoying the satisfactions associated with the world of work (Mishra, 2013). Bova and Kroth (2001) posited that every worker, regardless of age, level of education or organisational tenure, needs retraining approximately every five years to keep abreast with changes in technology, organisational structures and work processes.

The present debate on the suitability of graduates from tertiary institutions is largely concentrated on the relevancy of skills of graduates to the world of work. Kagaari (2007) posited that responses from industry suggest a high level of discontent with the type of graduates the labour market has to contend with. Jamali (2005) opined that the problem could be attributed to the kind of training programmes these graduates received which largely are at variance with current industry standards and requirements. Bennett (2002) remarked that employers place much premium on very flexible workforce with the expectation that these new entrants can turn things around and help them meet the changing needs of their customers. However, Cox and King (2006) are of the view that employers



are not the least expecting them to produce magic immediately, but as rightly pointed out by Boahin (2013), they need to have the capacity and the relevant commitment to acquire the industry needed skills to enable them effectively function in the working environment. Harvey (2004) postulated that graduates stand the chance of succeeding in the world of work if they are able to acquire the right balance of knowledge, skills and abilities for their preferred professions regardless of whether they are paid or not. Thus, it is vital for educators, employees and government to effectively collaborate to design and implement appropriate training programmes that would help equip trainees with the right skills.

To realise this, researchers and key industry players have submitted that internship or what is called industrial attachment in Ghana has the potential of equipping students with the much needed skills desired by industry. This type of training has the objective of exposing students to the real working environment and would provide students the opportunity to apply concepts that are learnt in the class room (Ab Rahman, Omar, Kofli, Mat, Osman, and Darus, 2009). Industrial attachment also has the added advantage of boosting the confidence level of students and intends assist them to settle quickly in real working environment (Maher and Graves, 2008). Thus, it is refreshing that CBT has industrial attachment as a major component of the programme and it is mandatory for students who are on it to undertake that exercise.

However, a number of research conducted on industrial attachment tend to concentrate on its importance to the trainees and rather fail to recognise the skills that are relevant and can help unleash the potential of students in the world of work (Yusof, Fauzi, Abidin, and



Awang, 2013). In line with this, Shipton, West, Bird, and Patterson, (2006) remarked that graduates develop capacities that can help them withstand certain shocks when they start working. Kagaari, (2007) posited that engineering graduates who had internship do better than colleagues who never had. In the same vein, (Omar, Kofli, Mat, Darus, Osman, Rahman, 2008) posited that students are satisfied with the training received and their performance through attachment and explicitly admitted improvements in their personal attitude, communication and working attitude after the training.

#### **2.14.2 Understanding Skills**

Chapman and Lovell (2006) posited that definitions of skills differ from general to definite because the former refers to any work setting on which people could be differentiated by way of performance of work, whereas the later involves only the competencies required to undertake defined job-related activities. It is relevant for skills to be defined because they are employed to determine the techniques in which job performance data are gathered, measured and used in comparing jobs, establishing occupational clusters, identifying transferable skills, and so on.

Chapman and Lovell (2006) stated that different approaches to describing skills were discovered. The most extensively recognised and used skills are the cognitive and physical or motor. The cognitive ones have to do with broad intelligence and may include learners ability to verbally comprehend, numerical manipulations, memory, and spatial ability among others. The physical skills on the other hand involves strength, stamina, flexibility and manual dexterity. The discussion on skills becomes more complex when there is no





generally accepted set of elements that should be included in the domain of cognitive skills. Should this skill category consist of only mental actions that are knowingly determined such as thinking skills, and discount comprehension and intuitive abilities, which are by all accounts very vital (Smith, 2009). More so, how far can skills be taught and learned, and are the skills people have acquired through training and education? If skills have to be taught, to what extent should they be added in the programme to make it a coherent whole instead of adopting separate actions and structured stages for skills to be learned.

It becomes even more complex when attempts are made to differentiate between key and core skills according to (Kearns, 2001), and even muddier to draw a distinction between generic and context-specific skills. Skills that are key are relevant for life and enable people to participate in employment. Such skills open the door and assist graduates to make use of their aptitudes and training. They are not limited to defined jobs or industries, but are useful for the total functioning of people in the world of work. On the other hand, skills that are core are developed as a result of the use of key skills. Core skills are job-related and are very useful for active participation in the place of work. Skills that are generic can be applied in a range of work settings. These skills can be transferred to a different work setting once they are acquired or applied in a new working environment. Kearns (2001) opined that generic skills are the future of vocational training since they form the basis of lifelong learning in recent times. However, it is argued that the knowledge a graduate has and his ability to use it in different work settings makes him productive and not just the skills (Hinchliffe, 2002).



### 2.14.3 Skills Complexity

Chapman and Lovell (2006) submitted that skills can be ranked relative to their level of complexity. They argued that a scale exists for most skills, since degrees of differentiation in skill level can be recognised. Hinchliffe (2002) added that at a basic level, skills may be narrow in range, but are still the foundation blocks of a person's capacity to carry out work-related responsibilities. In cognitive skills, a worker may understand the fundamentals of counting cash. At a little higher level, a worker can balance the day's accounts relative to the day's operational activities. At a higher level, the person assesses the extent to which business operations are in line with long term targets and strategic objectives, and can plan to correct deviations. At this more complex level of the task, cognitive skills require structured know-how to execute certain tasks with support of sound judgment and discretion. Besides, physical skills can also be established at diverse levels of ability. At higher levels of ability, they are used for the execution of tasks with simplicity and exactness. Thus, an objective could be achieved with maximum efficiency and a minimum use of energy.

Activities that require the use of skills could be arranged in sequential order. Hinchliffe (2002) argued that patterning which is the hierarchical organisation of activities that is part of a plan differentiates a skilled from an unskilled act. The plan is the systematic arrangement of laid down activities that are to be undertaken for a skilled act to be accomplished. Skilled acts are designed at the highest level of skill mastery. Such skills may require a series of activities supported by interpretative understanding and a performance oriented towards producing openly defined outcome or process. Interpretative



understanding he added, requires the participant to engage in the skill process and understanding the situations.

With respect to skills, quality is no longer the specialisation of a collection of academic or applied knowledge in the absolute, but it is about having the capacity to convert specific knowledge into activities that can produce answers to solve problems (ADEA, 2012). Thus, the stock and quality of generic and portable skills available and put to relevant use create the differences between countries in the areas of labour productivity, ability to attract investment, economic competitiveness, and social development (Ndoye and Walther, 2012). More so, the choice of skills suitable is influenced by a country's specific context and its development plans. While it is largely accepted that skills boosts productivity in the economy (ILO, 2012), this is usually only true where skills are acquired in an economic and social climate that is supportive of skill utilisation (King, Palmer, and Hayman, 2005; and Palmer, Wedgwood, Hayman, King, and Thin, 2007).

Nonetheless, due to the fact that the economy of Africa is lagging behind, three categories of skills were targeted as part of efforts geared towards the achievement of the Millennium Development Goals. These were:

- Common core basic skills;
- Technical and vocational skills;
- Science and technology skills.

There is also the need for continuous adaptation to meet the demands of the rapidly and radically changing world, and the promotion of lifelong learning as well as the different



opportunities for formal, non-formal and informal learning (UIL, 2014). Besides, barriers between disciplines have to be broken down in order to link learning to the problems of the surrounding society (UIL, 2013).

#### **2.14.4 Skills for Employability**

Most studies conducted on skills have different variables that constitute it. Among others, employers look for graduates who are practically oriented and have the ability to find solutions to tasks in a more innovative manner (UIL, 2011). In general, employers are interested in graduates with good communication skills, sense of empathy, motivation, effective decision making skills, proactive planning abilities and endless improvisation of talents (Yusof, *et al.*, 2013). In terms of professional jobs, employers are interested in both behavioural and technical qualities of the prospective employee that would be relevant to the working environment (Hassan, Ismail, Ahmad, Hassan, and Maisham, 2011). Although behavioural qualities may be the same to those expected from graduates by employers of other industries, technical skills required may vary based on the programme offered by a graduate.

In the field of engineering, the technical skills expected from them are gaining and using the basic concepts of engineering; competency in theoretical and research engineering; competency in application and practically oriented engineering; technical competence in a specific engineering discipline; ability to utilise a system approach to design and evaluate operational performance; ability to design and conduct experiments; as well as to analyse and interpret data (Abdullah *et al.*, 2007). In addition, Yorke and Knight (2006) put forward



three main elements for graduate employability which are personal qualities, core skills and process skills. Personal qualities are made up of self-awareness; self-confidence; willingness to learn; emotional intelligence; independence; and adaptability. Core skills comprises self-management; written and oral communication; and critical analysis. Process skills includes problem-solving; team working; computer literacy; integrity; work ethics; planning and prioritising; and coping with uncertainty.

McKinsey (2012) argued that advanced and medium skills are needed to drive a high-productivity economy and to fuel growth of labour-intensive sectors respectively. They added that the service sector needed high skills, particularly in health care and business services. To them, advanced economies could escape shortage of high skilled workers by increasing the growth rate in tertiary education, while also increasing the number of science, engineering, and other technical graduates and embarking on retraining of mid-career workers. In developing nations, capacity of high vocational schools should grow at two to three times their current rate. They advocated the combination of work and training to increase relationship with the world of work.

ILO (2012) model stipulated that there is an urgent need for the development of skills that enhances the capacities of prospective employees to enable them take advantage of job opportunities and improve personal bargaining power in the labour market. To achieve this, governments should ensure the broad availability of quality education; match supply to current and future demand for skills; help workers and enterprises adjust to change; expand access of quality education and training to promote social inclusiveness. They should also



support school-to-work transition and ensure that the youth remain attached to the labour market. They should also work with employers and workers organisations to determine policy making and training delivery.

Equally, the World Bank (2013), suggested that a core set of basic skills, both cognitive and social are necessary for productive employment and earnings. To World Bank, much emphasis should be put on vocational and life skills, modern and higher-level skills required in skills intensive services, such as financial intermediation, computer and information services, legal and technical support, and other business services. In all these, schooling should be fundamental for the further development of cognitive and social skills. Social skills remain malleable through adolescence and the early adult years (Abdullah *et al.*, 2007). Young adults can continue into more specialised skills building, including at tertiary levels. Generic skills are also needed to form the basis to learn and adapt to different tasks and problem-solving. Such general skills are especially important in more dynamic economic environments.

UNESCO (2012) skills model places much importance to foundation skills such as literacy and numeracy, which are considered prerequisites for continuing in education and training, and also for acquiring transferable technical and vocational skills. Transferable skills are relevant in problem-solving, communication and leadership, while technical and vocational skills are specific practical skills that prepare one for a particular job. World Bank (2013) asked for the collaboration with businesses and trade unions to ensure that skills training efforts are relevant to employment. It also advocate longer stay in school and



formal education that can help in acquiring transferable skills, while providing career guidance and access to training on entrepreneurship and financial management. It demands the use of basic technology, such as radio, to disseminate information and provide skills training for people in remote rural areas.

#### **2.14.5 Knowledge and Work**

Successful knowledge acquisition and transfer depends on the characteristics of both the trainee and the trainer (Easterby-Smith, Lyles, and Tsang, 2008). Argote, McEvily, and Reagans (2003) have identified ability, motivation, and opportunity as essential elements that could be crucial for the creation and transfer of knowledge to the working environment. Therefore, knowledge acquisition and its application in the world of work depends on trainees' ability, motivation, and opportunity to actualize it. Szulanski (1996) also identified recipient absorptive capacity as a critical factor in the successful application of knowledge. In the context of CBT in Tamale Polytechnic, knowledge, once received by trainees, must be better absorbed and utilised to contribute more to organisational performance.

This, therefore, suggests that the ability-motivation-opportunity framework is the primary building blocks of successful task performance (Boxall and Purcell, 2003). Ability refers to the knowledge, skills, and experience needed to perform a task. Motivation refers to the willingness or the degree to which a person is inclined to perform a task. Opportunity consists of resources in a workplace that supports the performance of a task (Blumberg and Pringle, 1982). Motivation involves the choices of direction (where to direct the effort),



intensity (the amount of effort to exert), and persistence of effort (Mitchell, 1997). Against this backdrop, students under the CBT programme ought to have the right mix of ability, motivation and opportunity to apply the knowledge acquired during their study period in Tamale Polytechnic.

However, industry trainers and lecturers may not be sufficiently motivated to transfer tacit knowledge which requires extensive interactions with other employees (Nonaka and Takeuchi, 1995). Furthermore, tacit knowledge is acquired through years of experience and that puts employees endowed with it in a position of privilege, power, and superiority. The fear of losing such advantages upon successfully transferring knowledge may deter others from doing so (Wong and Law, 1999). The reward system may not provide sufficient incentives for trainees to share their knowledge (Fey and Furu, 2008). Kane, Argote, and Levin (2005) suggested that appropriate incentives, shared identity and vision promote knowledge sharing

Suffice it to say that the absorptive capacity of students may moderate the relationship between knowledge transferred and knowledge received by them. The success of knowledge transfer requires students to successfully receive it from the givers (Salina and Wan, 2011). Theory of knowledge management suggests that knowledge transfer success depends on the characteristics of both the source and the recipient (Easterby-Smith *et al.*, 2008). It is possible that lecturers as sources of knowledge have the competencies to transfer knowledge, but students as recipients are unable to acquire it because they do not have the relevant previous knowledge that would support them recognise, understand, and





process the new knowledge given to them (Cohen and Levinthal, 1990). Certainly, relevant previous knowledge is useful for absorptive capacity and effective knowledge acquisition. Earlier studies also submitted that cultural differences between source and recipient could hinder knowledge acquisition (Van Wijk *et al.*, 2011). It is possible that students will perceive the knowledge from industry trainers and some lecturers to be foreign and less valuable in their local context (Szulanski, 1996) and this could discourage them from actively participating in the learning process, hence, less knowledge acquired by the learner. Therefore, lower absorptive capacity would result in a weak relationship between trainers' competencies in knowledge transfer and knowledge received by the students at which they are working and vice-versa.

#### **2.14.6 Attitudes and Work**

Attitudes among other variables are regarded by several researchers as being key when attempting to understand and explain variability in students learning outcomes (Köğçe, Yıldız, Aydın, and Altındağ, 2009). There are different definitions of attitudes by various authors based on their angles of thoughts. Eshun, (2004) defined an attitude as a disposition towards an aspect or a whole area of study that has been acquired by an individual through the person's beliefs and experiences but which could be changed. When emphasising the importance of individual experiences, the contexts where students interact with others and with the programme of study become focal points.

Fraser and Kahle (2007) submitted that learning environments at home, at school, and within the peer group accounted for a significant amount of variance in student attitudes



and that class ethos had a significant impact on the scores achieved by students for these attitudes. Mohamed and Waheed (2011) identified three groups of factors that play a vital role in influencing student attitudes: factors associated with the students themselves (mathematical achievement, anxiety, self-efficacy and self-concept, motivation, and experiences at school); factors associated with lecturing (lecturing materials, classroom management, teacher knowledge, attitudes towards programme, guidance, beliefs); finally factors from the home environment (educational background, parental expectations).

Attitudes can be seen either as positive or negative ones. A positive attitude towards a programme reflects a positive emotional disposition in relation to the programme. Conversely, a negative attitude towards the programme relates to a negative emotional disposition (Zan and Martino, 2008). These emotional dispositions have an impact on an individual's behaviour, as a student is likely to achieve better in programmes that excite them and have confidence in or finds it useful (Eshun, 2004). For this reason, positive attitudes towards CBT programme are desirable since they may influence students' willingness to learn and benefit from the instructions received.

CBT affects not only typical competence in interpersonal and cognitive domains, but also more general work-related skills considered important for success in professional practice. Hande, Mohammed, and Komattil (2015) argued that there is a significant positive correlation between acquisition of generic skills and attitude, and that of knowledge and attitude. Development of positive attitudes for the world of work are now widely accepted as important outcomes of CBT and are being included in the curriculum of the programme.



It is observed that the inclusion of attitudes in CBT curriculum contributes to the acquisition of not only knowledge but also generic competence and personal skills, such as problem-solving, communication and teamwork, which are essential for all graduates of higher education (Hande, *et al.*, (2015).

Schmidt, Vermeulen, and Van Der Molen, (2006) compared graduates of CBT and conventional curricula and found that students trained using the former rated themselves as having better interpersonal skills, better competence in problem-solving, self-directed learning and information-gathering, and somewhat better skills in areas such as the ability to work and efficiently plan. The CBT approach also generates a more stimulating, challenging educational environment; and the beneficial effects of the generic attributes acquired in this way should not be underestimated. Boud and Feletti (1997) presented that CBT approach to training students encourages small-group activities which help to promote outcomes such as teamwork and communication skills.

### **2.15. Conceptual Framework of CBT in Tamale Polytechnic**

From the reviewed literature, it is evident that several factors could be responsible for acquisition of desired competencies relevant for undertaking professional tasks. In this research, it is observed and therefore argued that attainment of competencies for effective practice in the world of work is fundamentally influenced by the learning support facilities, participation of industry, assessment model employed by the polytechnic, and demographic characteristics of lecturers and students. In other words, it shows the causal relationship between the dependent, intervening and independent variables.



The concept of CBT has been a contentious issue as several players have expressed diverse opinions about its capacity to provide demand-driven skills for industry, employers, training institutions and workers. The concept is reported to have created a strong relationship between industry players and training institutions. Cremers *et al.*, (2005) stated that CBT improved the link between theory and practice. Callan and Ashworth (2004) expressed that CBT has positive effect on productivity, efficiency, effectiveness and the production and delivery of superior products. Besides, it is also able to assist workers adapt to changing work place dynamics.

While building the competence level of workforce is absolutely crucial, it may not be sufficient in addressing skills shortages in the context of this rapidly changing technological world coupled with the free movement of labour (Boahin 2013). Therefore, the mastery of a specific skill for a prescribed job may not necessarily guarantee a worker the needed competence. The competencies acquired should be capable of making graduates flexible, initiative and adjust properly in diverse work settings (Neilson, 2007). Brown and McCracken (2009) stated that though CBT has been implemented in several countries for so many years now, industries are in continuous hunt for workers with the capacity to combine technical with employability skills for effective involvement at the place of work. It is, therefore, relevant that a conceptual framework depicting the variables that determine the effectiveness of CBT in equipping students with desired industry competence as implemented in Tamale Polytechnic is presented in Figure 2.1 below.



### **2.15.1 Independent Variables:**

The independent variables are those that have the capacity to influence the dependent variables as shown in Figure 2. 1. In this framework, lecturing and learning facilities designed for the CBT can reasonably influence acquisition of knowledge, skill and job-related attitudes. They embody demonstrable portion of a training that can be learned to gain prescribed competencies to perform a particular task (Hennessy, Hernandez, Kieran, and MacLoughlin, 2010). CBT considers the physical learning facilities such as modern, Internet-enabled libraries, skills and simulation laboratories, and computer laboratories as essential enhancements to lecturing and learning (Akiode, Feters, Okoh, Dah, Akwuba, and Oji, 2010). Internet-based learning has been extensively studied, and several meta-analyses indicate that it can be as effective as traditional classroom-based learning in terms of student's satisfaction and knowledge acquisition (Zucker, 2008). It does present challenges for the development and assessment of hands-on skills, but these can be offset through the use of simulations and computer-based virtual activities (Adler and Johnson 2000). This study therefore argue that in Tamale Polytechnic, learning facilities would play a significant role towards the effectiveness of CBT.

As Gulikers (2006) reported when students' assessment is compatible with their future professional aspirations, they are motivated to effectively learn which would enable them to develop the desired professional competencies. The assessment system designed for the CBT enables assessors to compare students' performances relative to the prescribed standards. Assessments are based on the demonstration of skills required and could be conducted either in a workshop or a simulated environment. This study posits that



assessment system for students would have a direct impact on the acquisition of needed competencies by using occasional reminders and task-related feedback. Assessment could assist learners to acquire both the needed technical and professional skills employers would need (Waterhouse and Virgona, 2004). This study therefore expects assessment to be a significant predictor of CBT effectiveness.

The effectiveness of a teacher could be influenced by his age, gender, experience and competencies in both technical and instructional skills in the delivery of CBT. Lecturers are expected to have sufficient understanding of the area being taught and the right balance of skills for effective delivery of the lesson. Students rely on lecturers for relevant learning support that would assist them acquire the needed competencies. Lecturers are also required to provide feedback to students' concerning their performances in the context of what is being studied. The feedback provided would enable students to study at times that would be convenient to them. This research therefore anticipates the characteristics of lecturers to have an effect on the acquisition of professional skills through feedback since CBT is student-oriented, self-regulated and mastery of specific skill which entails coaching, instant awareness and constant support at relevant times during the learning process. Providing timely feedback with the right continual support on students' performances would have direct effect on the acquisition of required competencies for professional tasks (NCTVET, 2006, and Misko, 2000).

Also, the participation of industry in CBT offers them the opportunity to play an important part in the competencies development process through the industrial attachment component



of the programme. Personnel of Industry supervise, coach and mentor students for the period of attachment. They also assess students within the same period. Therefore, their participation is expected to significantly contribute towards the effectiveness of the programme, hence their inclusion in the construct.

Students are principal stakeholders in the CBT programme and their performance could be influenced by characteristics such as age, gender, and economic background of parents (McKenzie and Gow, 2004). Ofori (2000) opined that older students are assertive and are always keen in establishing one-to-one contacts or discussions with lecturers and tutors, thus fostering a deep approach to learning and performance. Matured students work out the meaning of information for themselves and do not accept ideas without critical examination. They relate ideas from their studies to a wider context and look for reasons, justification, and logic behind ideas (Sadler-Smith, 1996). Besides, female students are noted to be outperforming their male counterparts (HEA, 2004). Research has shown that female undergraduates grade point average (GPA) are higher than that achieved by male students after the first year of study (Strahan, 2003), and across three years of undergraduate study (Woodfield *et al.*, 2006). Students from relatively better economic backgrounds are noted to have performed better than their counterparts from poor households. Therefore this study asserts that these characteristics are important determinants in the effectiveness of CBT.



### 2.15.2 Intervening Variables

These are variables that could impede or disrupt the independent variables from achieving the dependent variable which in this case is the acquisition of desired competencies as presented in Figure 2. 1. In this regard, the extensive educational reforms undertaken by Government of Ghana had their philosophical underpinning in ‘hands-on skills’ development, but failed to achieve that objective. The missing link in Ghana’s industrial development is due to the neglect of hands-on training for the youth (Nsiah-Gyabaah, and Ankomah, 2009). The lack of attention to student-led, industry driven training regimes in Ghana, over the years, has been a central issue in the countries quest to provide employable skills to prospective employees. Akyeampong (2010) stated that graduates employment levels in Ghana are low because it is supply-driven instead of it being market-led. This has been largely attributed to lack of national policy framework to address these skills gap in a coordinated manner. Several years of poor resource allocation to the educational sector has negatively impacted skills development (Ansah and Ernest, 2013).

Gondwe and Walenkamp (2011) reported that the actual content of programmes does not address the needs of the workplace. Presentation of instruction to students take place mainly in the form of head-on learning from lecturers. The polytechnics are unable to combine theoretical training with practical exposure to enable graduates acquire the desired skills for absorption by industry. The snowballing effect of these constraints has created a situation where much emphasis is placed on class room instructions to assist students obtain qualifications based on theoretical examinations.





### 2.15.3 Dependent variable: Desired Competencies for Students

The acquisition of desired competencies constitutes the dependent variable in this study and that refers to the needed competencies that are required to undertake a given task as shown in Figure 2. 1. Most studies conducted on skills development have different variables that constitutes it. Employers among others look for graduates who are practically oriented and have the ability to find solutions to tasks in a more innovative manner (Zehrer and Mosenlechner, 2009). In general, employers are interested in graduates with good communication skills, sense of empathy, motivation, effective decision making skills, proactive planning abilities and endless improvisation talents (Yusof *et al.*, 2013). In terms of professional jobs, employers are interested in both behavioural and technical qualities of the prospective employee that would be relevant to the working environment (Hassan *et al.*, 2011). Although behavioural qualities may be the same to those expected from graduates by employers of other industries, technical skills required may vary based on the programme offered by a graduate.

Easterby-Smith *et al.*, (2008) indicated that successful knowledge acquisition and transfer depends on the characteristics of both the trainee and the trainer. Argote *et al.*, (2003) identified ability, motivation, and opportunity as essential elements that could be crucial for the creation and transfer of knowledge to the working environment. Therefore, knowledge acquisition and its application in the world of work depends on trainees' ability, motivation, and opportunity to actualize it. Szulanski, (1996) also identified recipient absorptive capacity as a critical factor in the successful application of knowledge. In the context of CBT in Tamale Polytechnic, knowledge, once received by trainees, should be

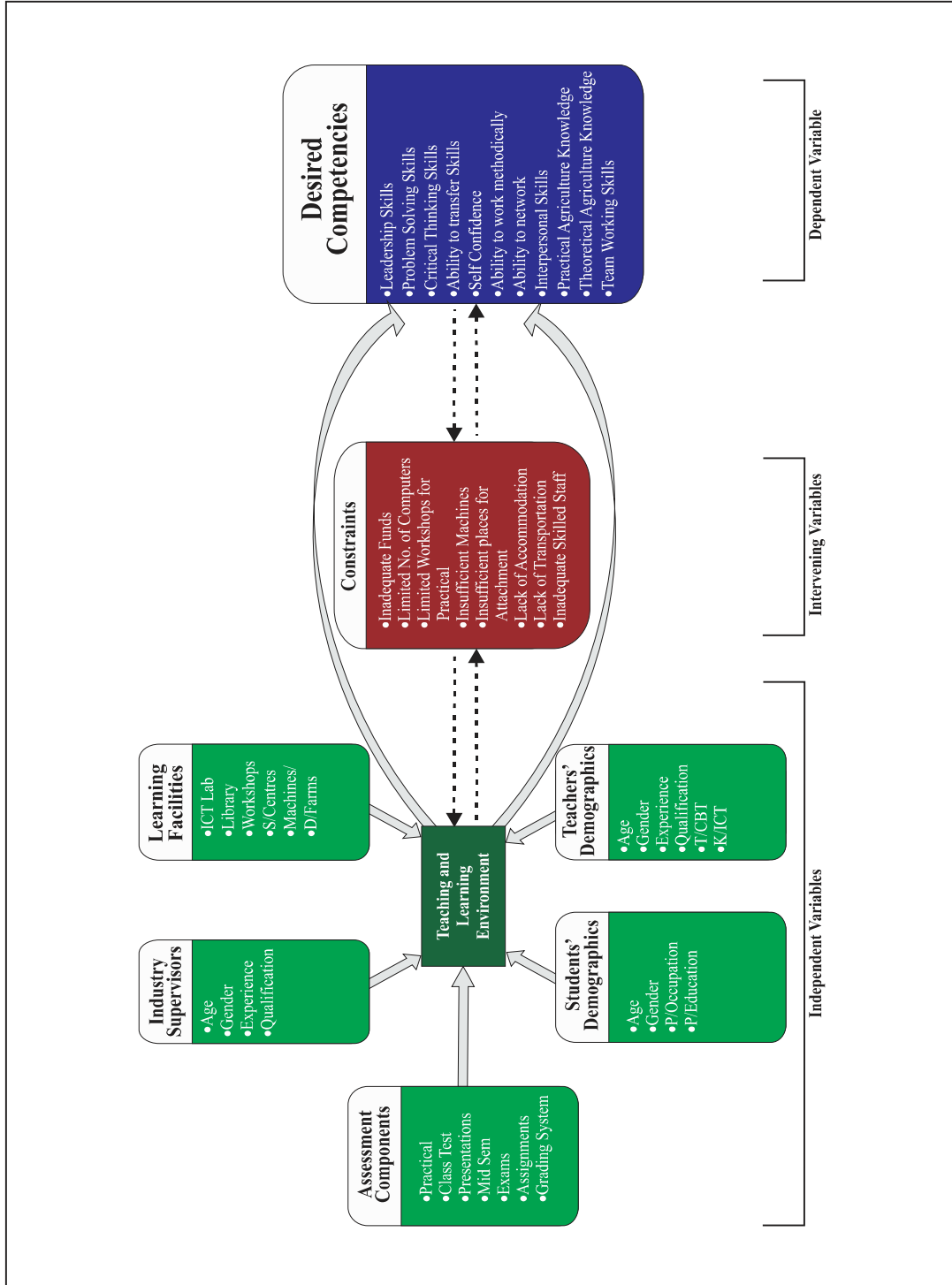


better absorbed and utilised in order that they might contribute more to organisational performance.

In today's fast moving world, workers are required to have skills in ICT, creativity, communication, problem-solving, organisational, teamwork, proactivity and adaptability to be able to effectively handle tasks. These competencies enable graduates to adapt, and transfer skills and knowledge in a different work setting, and ability to work with people from diverse backgrounds in terms of ages, race or gender.



**Figure 2.1 Conceptual Framework of the Competency-Based Training in Tamale Polytechnic**



Source: Author's construct, 2014



## CHAPTER THREE

### METHODOLOGY

#### **3.0 Introduction**

This chapter focuses on methodological issues including the procedures employed for data collection aimed at investigating the effectiveness of the CBT programme in equipping students with industry desired skills. It offers an exploration of the concepts underpinning research design, the study area, study population, sample and sampling procedure, data collection instruments, and data analysis techniques used in the study.

#### **3.1 Research Design**

The design is the structure of any scientific work and it gives direction, systematizes the research and provides a framework which underpins the whole project (Travis, 2007). It is usually considered as a construction that indicates how different parts of a study such as data, methods and measures could work together to provide answers to specific research questions (Trochim, 2006). In social science research, there are a wide variety of research designs, such as experimental, cross-sectional or social survey, longitudinal and case study designs. This study used descriptive survey to describe the effect of CBT on Agricultural Engineering students' acquisitions of competencies needed for the world of work. The study adopted this methodology due to the limitations of other research designs such as the deliberate control and manipulation of conditions of the study in an experimental design; the time and cost involved in a longitudinal design; and the limited generalisability of the results from a case study (Bryman, 2004). Besides, the design is cost-effective and a more dependable method for gathering data (Alreck and Settle, 2004). Under this method, survey



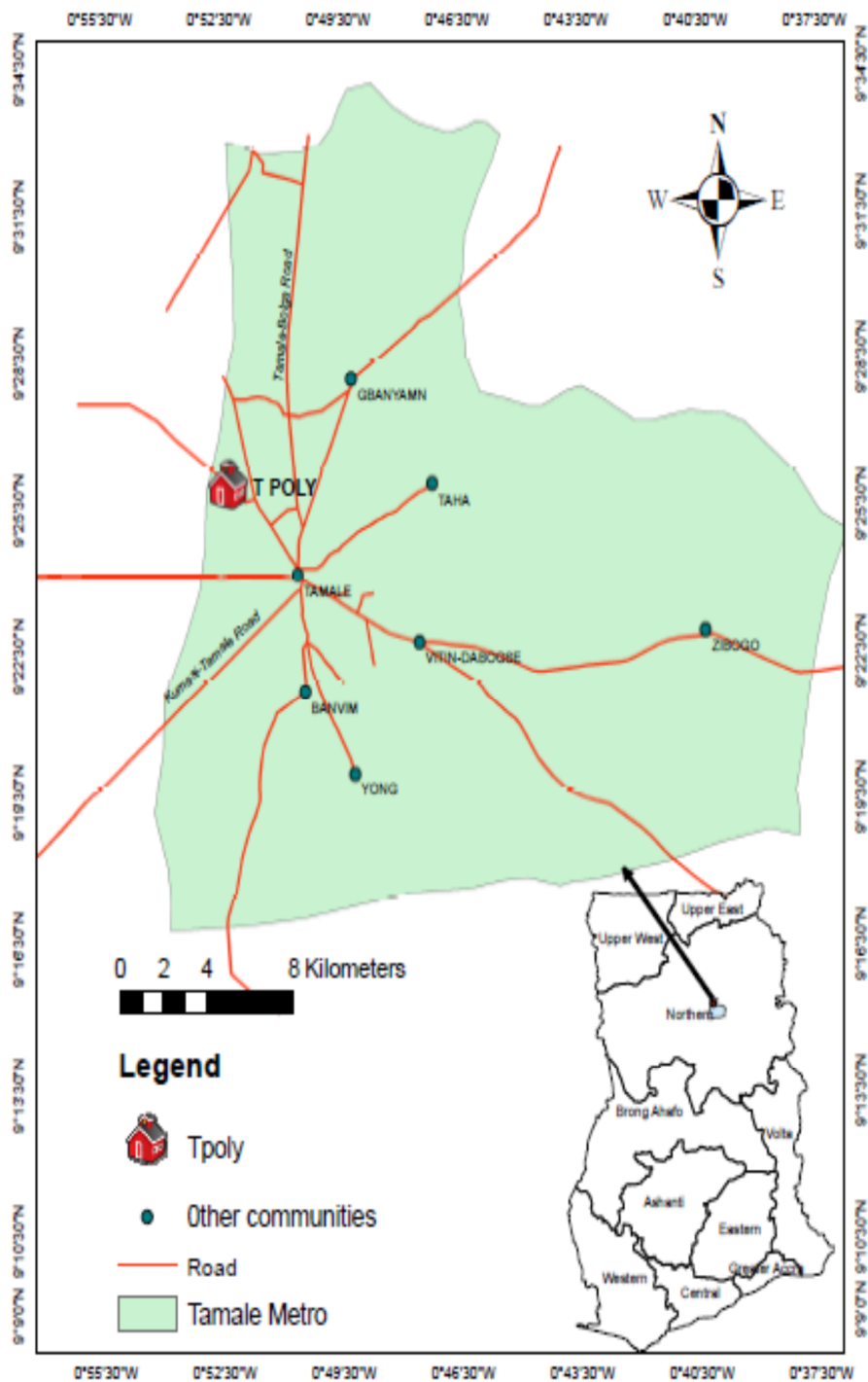
data may be collected via mail, telephone, and in-person surveys (Oladele *et al*, 2011). Survey research is used extensively in education as well as in other research areas because it is flexible, efficient and the results are generalisable (McMillan, 2004).

### **3.2.0 The Study Area - Tamale Polytechnic**

Tamale Polytechnic, the study area, is located in the Tamale Metropolis, the capital of Northern Region in Ghana. Tamale Polytechnic was established in 1951 as a Trade School which later became a Government Training School in 1954. It was later transformed into a Junior Technical Institute in 1960, and in 1984, it was upgraded to the status of a non-tertiary Polytechnic with a responsibility to offer advanced craft, technician and diploma programmes. In 1992, the polytechnic was further upgraded to the level of a full tertiary institution with five others, in the country, namely, Accra, Cape Coast, Kumasi, Ho, and Takoradi Polytechnics following the promulgation of Provisional National Defense Council (PNDC) law 321 as part of the educational reforms which sought to address the skills deficit in the county. Since then, the polytechnic has been turning out students who are trained up to the Higher National Diploma (HND) level in various programmes. The Tamale Polytechnic is situated on latitude 9.16° and 9.34° North and longitudes 00.36° and 00.57 south as shown in Figure 3. 1.



Figure 3. 1: Map of Tamale Polytechnic



Source: author, 2014



### **3.3.1 Student Population of Tamale Polytechnic**

The student population increased from 2,324 in 1992/93 academic year to 7, 430 in 2000 and started declining to as low as 5, 857 in 2004/2005 (TPSP, 2013). The population however, increased from 5, 777 in the 2008/09 academic year to 6, 483 in 2009/10, and increased further to 7, 691 in 2010/11 and reduced to 7, 506 in 2011/12 academic year. The female enrolment rate has been fluctuating between 16% and 33% over the 1992/93 to 2011/2012 academic years. The low female enrolment levels is a reflection of poor female participation at the basic levels of education in the northern part of Ghana and this requires collective action from all stakeholders to reverse the trend.

### **3.3.2 The Agricultural Engineering Department**

The Agricultural Engineering Department is one of the six academic Departments under the Faculty of Engineering. It is one of the pioneer Departments that was mounted in the Tamale Polytechnic at its inception to train middle level Agricultural Engineers in the country where the main economic activity is farming and its associated tasks. The HND programme is currently run on a Competency-Based Training (CBT) system which is hands-on, student centred and practical-oriented. Students graduate with specialisation in Post-Harvest Technology, Soil and Water Engineering and Mechanisation, and Machinery options. At the non-tertiary level, the Department also admits students for the Agricultural Engineering Technician one programme. The programme started with a staff strength of five (5) in 1994, but that has experienced significant improvement to eighteen (18). Besides, students' population at the inception of the programme stood at seven (7), but the current student population is two hundred and forty (240).



At the inception of the CBT programme in 2005, the Department had only three lecturing staff who had master degrees or were in lectureship status, three first degree holders, four diploma holders and one technician certificate. However, the Department now has two PhD holders, ten master degree holders, two first degree holders, one diploma holder and one workshop assistant.

The mission of the Department is to become a centre of academic excellence for training, developing skilled and competent middle level manpower that will be of service to their immediate communities and the nation as a whole. Atsu (2013), a former head of the Department intimated that the Agricultural Engineering Department's aim is to:

- develop the Higher National Diploma Agricultural Engineering programme into a professional career that can provide excellent opportunities for graduates;
- have qualified and effective lecturing staff that would have the capacity to deliver CBT in the Department;
- establish collaboration with industry to assist in the training of both students and staff, assessment of students and review of the curriculum of the programme.

#### **3.4. Population and Sampling Procedure**

The population of the study (N) was made up of all Agricultural Engineering students of Tamale Polytechnic from 2009 to 2014, lecturers in the Agricultural Engineering Department, and industry supervisors who supervised students during industrial attachment. Students were included in the study because they are the immediate beneficiaries of the programme so obtaining their responses was useful in determining the





programme effectiveness. Graduates from the programme were also included in the study because they had gone through it and as such, were better placed to know whether it was effective or not. Lecturers' inclusion in the study was useful because they teach, supervise and assess students both within the polytechnic and at the industry level. Supervisors at the industry level were also included in the study because they assist in mentoring, coaching and assessing students during industrial attachments.

A multi-stage sampling approach was used to obtain the sample for the study. Students were stratified into first, second and third years of their study. The first and second years were purposively selected for the study due to the fact that they had not undertaken or completed their industrial attachment yet and using them would demonstrate whether CBT has the capacity to enhance their competencies or not. The study asserted that a minimum of one year learning or two semesters on the programme was sufficient to establish the effectiveness of CBT to provide industry needed skills. The third years were not selected because they were not supposed to do industrial attachment per the programme design.

The sample frame for students, lecturers and industry supervisors were obtained from the Agricultural Engineering Department of Tamale Polytechnic. A sample size of seventy three (73) first year students and (50) second years from a total population of (90) and (60) respectively were selected for the study based on Krejcie and Morgan (1970) Table for determining sample size. Simple random sampling was used to select the required respondents. With the first years, numbers from 1 to 90 were written on pieces of paper and kept in a basket for students to pick. This was done to determine the order in which the



picking was to be done. That is, any student who picked one was supposed to be the first to pick in the next process and anybody who picked ninety was supposed to be the last to pick. Following this order, another set of pieces of papers numbered 73 with 'yes' and another set numbered 17 with 'no' written on them were mixed and given to students to pick. All those who picked papers with 'yes' on them became participants in the study. The same process was also used to select the 50 respondents from the second years.

The study used purposive sampling technique to select both the polytechnic and industry supervisors in this study. Out of the eighteen (18) lecturers in the Agricultural Engineering Department, ten (10) were purposively selected because of the training they received and their experience in the CBT programme. Twenty seven (27) industry supervisors were also purposively selected from a total population of forty three (43) because of their experience and preparedness to accept students for industrial attachment based on the recommendation of the staff in the Agricultural Engineering Department.

Fifteen (15) graduates from the CBT programme were selected for interviews using the snowball sampling technique because the researcher did not know them and had to rely on the lecturers in the Department who recommended two graduates. After my interview with them, I asked them to recommend other graduates of the programme. The process continued until the targeted 15 was obtained. This researcher also had in-depth interview session with Ten (10) industry supervisors, and (5) lecturers. In all, a total of one hundred and ninety (190) respondents were used for the study.



### **3.5.0 Data Collection Methods and Instruments**

The research instruments employed for the study were combination of questionnaire items, interviews and observation. In this study, because of time constraints and the need to collect a significant amount of information, data were obtained using administration of questionnaire, in-depth interview and observation guides to solicit data from students, lecturers and industry supervisors at the industry level.

Quantitative and qualitative methods of gathering data were used bearing in mind the research questions that ought to be addressed in this study. Qualitative data were collected through interviews and observation, while quantitative data were gathered with the use of administration of questionnaire. Baker (1994) stressed the importance of using more than one method of data-collection which allows for cross-checking the reality of certain phenomena and the reliability of individual versions by gathering data from a number of sources and subsequently comparing and contrasting different versions to produce results that are as full and balanced as possible. Patton (2002) agreed that the use of multiple data sources through interviews, observations and documentary analysis assist the researcher to confirm or disapprove other findings. With this, it is possible to build on the strengths of each type of data collection technique while minimising the weakness of any single approach. As Hogan (2007) submitted, the limitations in one method can be compensated for by the strengths of the other. Brannen (1992) posited that a multi-method approach can serve as an exercise in clarification in the formulation of the research problem and the most appropriate ways in which these problems could be theorised and studied.



### **3.5.1 Administration of Questionnaire**

Copies of structured questionnaire were employed to collect data from lecturers, students and industry mentors who participated in the CBT programme with help of two field assistants. Questionnaire can address a wide variety of issues and concerns. Questionnaire as a tool was used because it is more objective, relatively quick to collect data, and are more cost-effective (Chun-Fu, 2009; and Dessler, 2008). A set of questions on demographic characteristics of lecturers, students and industry supervisors as well as logistical constraints, learning facilities, mode of assessment and students purported competencies were developed by the researcher. The instruments for data collection were developed with the support of reviewed literature and contribution of lecturers from the Agricultural Engineering Department of Tamale Polytechnic. Competency was measured by asking students, lecturers, and industry supervisors to indicate students' levels of competence in performing expected tasks. The listed tasks were related to the list of competencies that students purportedly acquired from the Polytechnic courses.

Administration of questionnaire was used to collect baseline data on each respondents, against which to measure the student's self-rating on competencies after the industrial attachment and this was done before they went for their industrial attachment. The same group of students were asked to complete questionnaire that was identical to the one they completed before embarking on their industrial attachment. A set of similar questionnaire was also administered to lecturers and industry supervisors to obtain their responses on the effectiveness of the programme.



However, questionnaire needs to be kept short and this brevity could starve the researcher of useful information. The justification is that reactive effects may occur in that respondents may feel compelled to answer what they may regard as socially or contextually unacceptable; responses may be selective and not complete; respondents may leave out or fail to recall important information; open-ended items may reflect differences in written or verbal ability and thus obscure matters of interest and importance; and data analysis for open-ended items may be very time consuming. On the balance however, questionnaire were most likely to best serve the research purposes with regard to students, lecturers and industry mentors given the large number of participants, the distance to be covered, areas to be covered, time available to do it and the in-depth analysis to be done thereafter (Ross, 2000).

### **3.5.2 Validation and Reliability of Research Instruments**

Validity is an essential exercise in research and it is a requirement for both quantitative and qualitative research (Cohen, Manion, and Morrison, 2001). It is important in research that valid instruments should be employed to protect its credibility. To determine the content validity of the questionnaire, pilot study was conducted using three (3) and ten (10) students at Bolgatanga Polytechnic, and two (2) industry supervisors who were randomly selected. A retest was undertaken to compensate for the members' perhaps lack of expertise by using two experts in the Faculty of Agribusiness and Communication Sciences in the University for Development Studies who have been involved in the field of evaluation, training and development, curriculum design and assessment to independently read and assess the instruments. They generally affirmed that their composition and structure were appropriate.



They suggested changes with regard to their structure, shape and size all intended to maintain the interest of the respondents and to enhance their understanding of what was being sought. As Gay and Airasian (2000) asserted, content validity can be achieved by expert's judgement. Experts in the area covered by the test were asked to assess its content validity. These experts carefully reviewed the process used to develop the test as well as the test itself, and they made thorough judgement concerning how well items represented the variables in this study.

All lecturers, students and industry supervisors who participated in the pilot study were not part of the main survey since they were not students of Tamale Polytechnic. Piloting was undertaken principally to increase the reliability, validity and practicability of the questionnaire (Morrison, 1993). It was a way of pre-testing the research instrument to ascertain its appropriateness for the study (Baker, 1994). De Vaus (2002) opined that researchers should not take the risk of administering questionnaire without piloting first. Piloting provides an opportunity for flaws and deficiencies in a study to be identified and remedied. It also has the capacity to give advance signals about whether a proposed method or instrument is appropriate or not (Robson, 1993). The pilot testing was helpful in that it highlighted a number of shortcomings and difficulties that were later remedied. Revisions were made on ambiguous and overlapping questions, and on the design and wording of questions. A pilot study was undertaken and responses used to improve the content validity of the instrument.



This researcher took certain steps in order to ensure the reliability and validity of research questions that were to be used for the interview. Firstly, the proposed set of research questions were discussed with the main supervisor who has wealth of experience in qualitative research to help shape the questions to acceptable standards and to ensure that key areas of the study were covered. Besides, other PhD students working on related subjects were also extensively consulted on the nature of the questions and that also helped in strengthening the validity of the interview questions. Consequently, a decision was taken to interview former students who were trained under the CBT concept, lecturers in the Department who have been lecturing students on the model, and industry supervisors who have been training students at the industry level. Fifteen (15) graduates from the CBT were selected for the study because they had gone through the programme, hence were better placed to know whether the programme was effective in helping students acquire the needed industry competencies which this study sought to investigate. Five (5) lecturers were also purposively selected for the interview because they have been lecturing and assessing students using the CBT model and are therefore equipped with wealth of knowledge about the programme. All lecturers who took part in the interviewing session were not included in the questionnaire administration. Ten (10) supervisors at the industry level were also selected because they assist in the training and assessment of students, and are, as a result, in a good position to know whether the programme is effective or not. The supervisors who were interviewed were excluded from the questionnaire administration. The researcher had interview sessions with a total of 30 participants. The study assumed that getting responses from all these respondents would enhance the validity of the data since responses would be gathered from different sources. Data was recorded by employing



note-taking and tape-recording if respondents were comfortable with any of them (Yates, 2004). This was meant to enrich the outcome of the research, give confidence in the accuracy of the interview process and to ensure the reliability of the research in general.

### **3.5.3 Interviews**

Amaratunga, Baldry, Sarshar, and Newton (2002) defined research interview as the gathering of opinions of the life-world of the interviewee which interprets the meaning of a described phenomenon. Saunders, Lewis, and Thornhill (2007) describe interviews as a purposeful discussion between two or more people. This method provides valid and reliable data which are relevant to the research purposes. Yin (2009) submitted that interview is one of the most vital sources of information. Interviews may be face-to-face, voice-to voice or screen-to-screen which may be conducted with individuals or groups. Interviews are considered to be the best method of gathering information (Easterby-Smith, Thorpe, and Lowe, 1991). Sekaran (2003) asserted that interviews may provide more in-depth information about specific variables of interest. Patton (2002), added that the data in qualitative research might include transcripts of in-depth interviews, direct observations or document review. Oppenheim (2000) in his words opined that in-depth interviews can help researchers understand the connotations of people's activities and that this allows the researcher to explain the purpose of the study and to clarify any doubt or avoid any misunderstanding. In contrast to an unstructured or conversational approach, a number of pre-determined questions have to be explored, rather than leaving the respondents to generally talk about the research problem.





In this research, semi-structured interview was employed since the objective of the study was to ascertain the effectiveness of Competency-Based Training in the acquisition of industry desired competencies of Agricultural Engineering students in Tamale Polytechnic, Ghana. Yates (2004), postulated that interview is a good way of exploring participants' subjective opinions on issues of interest to them. Respondents were asked questions that provided them the opportunity to make their submissions on whether the CBT programme is effective or not and what can be done to make it more effective. Saunders *et al.*, (2007) argued that interviews are used in qualitative research not only to reveal and understand the 'what' and 'how', but also to place more emphasis on explaining the 'why'. This research focuses on not only numbers, but it also relies so much on participant's interactions, behaviours, experiences, and attitudes. Jankowicz (2005) observed that the semi-structured interview allows the flexibility required for such a study, as the researcher would not be able to use the same questions using other instruments. Hakim (2000) holds the view that in-depth interviews can also reveal the reasons for any discrepancy between stated attitudes and actual behaviour.

Interviews were also conducted to solicit information from lecturers, industry supervisors, and graduates who had training through the CBT programme. They were used as a tool to corroborate answers supplied by respondents in other instruments. They were also employed to shed more light on the issues being investigated (Chun-Fu, 2009). Suffice to say that, open-ended questions were used to collect data because they provide the respondents the opportunity to freely express their opinions without restrictions. Cohen, *et al.*, (2001) reported that open-ended questions do not require answers from a defined range



of responses and that means every respondent is given the chance to answer questions the way they know them. Chun-Fu, (2009) pointed out that studies which generally require quantitative and qualitative data would need a combination of a wide range of methods to produce a useful outcome. Besides, documentary analysis of educational files and records can prove to be an extremely valuable source of data (Johnson, 2008).

All questions pertaining to the interview were asked in English language because all respondents could speak and write in English. Respondents were given the opportunity to seek clarification on questions they did not understand. As Fontana and Frey (1994) submitted, use of language is crucial for creating participatory meanings in which both interviewer and respondent understand the contextual nature of the interview. All notes that were taken at interviews granted were subjected to further transcription that allowed meanings to be made out of them and this was done shortly after interviews were conducted. Tape recordings were played a number of times to ascertain the actual words and meanings before they were transcribed. Colleagues on similar PhD programmes were given the responses and transcriptions for their critiques. These transcriptions were finally submitted to my supervisors for further validation before they were used either to support or contrast findings made using other instruments.

An interview guide or "schedule" was a list of questions that allowed the interviewer to have a symbolic interaction with the respondents. This was prepared to ensure that similar information was obtained from each participant. There were no predetermined responses, and further probing was done to explore these predetermined inquiry areas. The interview



guide ensured good use of limited interview time, made interviewing more systematic and comprehensive, and helped to keep interactions focused.

#### **3.5.4 Observation**

The classic form of data collection in naturalistic or field research is observation of participants in the context of a natural scene. Observational data are used for the purpose of description of settings, activities, people, and the meanings of what is observed from the perspective of the participants. Observation can lead to deeper understandings than interviews alone, because it provides a knowledge of the context in which events occur, and may enable the researcher to see things that participants themselves are not aware of, or that they are unwilling to discuss (Patton, 2002). A skilled observer is one who is trained in the process of monitoring both verbal and nonverbal cues, and in the use of concrete, unambiguous, descriptive language. Sekaran (2003) recommends observational studies as a means of providing rich data and insights into the nature of an observed phenomena. In the same vein, Delbridge and Kirkpatrick (1994) submitted that observation provides an opportunity for one to see how documents and records are actually handled, processed, and how different processes interact.

Gill and Johnson (2002) observed that there are several observation strategies available. In some cases it may be possible and desirable for the researcher to watch from outside, without being observed. The observer can also maintain a passive presence, being as unobtrusive as possible and not interacting with participants. A third strategy is to engage in limited interaction, intervening only when further clarification of actions is needed.



Besides, the researcher may exercise more active control over the observation, as in the case of a formal interview to elicit specific types of information. Finally, the researcher may act as a full participant in the situation, with either a hidden or known identity. Each of these strategies has specific advantages, disadvantages and concerns which must be carefully examined by the researcher (Schatzman and Strauss, 1973). Therefore, the purpose of the study, appropriateness of the research questions and objectives, time of the study, suitability of the participant in the direct observation, personal flexibility, organisational access and ethical considerations are relevant issues that should be considered when employing observation as an instrument for data collection.

In this research, the third strategy was used to engage in limited interaction, intervening only when further clarification of actions were needed. This was employed to enable the researcher observe training sessions and to acquaint himself with the learning facilities, grading system, mode of assessment and the constraints of the CBT programme. This researcher participated in lectures and also attended practical sessions to enable him to see things for himself. Such visits assisted the researcher to see how these desired competencies were taught and practised at both the polytechnic and industry level. Within the Polytechnic, visits were made to the ICT centre, practicals workshop and lecture sessions. In addition, this researcher visited five organisations where students had their industrial attachment training. However, care was taken in order to respect desired ethical standards required in all the visited areas.



The study relied largely on the use of field notes to capture running descriptions of settings, people, activities, and sounds. This is in tandem with Lofland and Lofland (1984) who recommended that jotting down notes will serve as a memory aid when full field notes are constructed. This was done as soon after observation as possible, preferably the same day. In addition to field notes, audio tapes were used as means of accurately capturing settings where possible.

### **3.6.0 Method of data analysis**

This section presents the various methods that were used to analyse data as shown below.

#### **3.6.1 Quantitative Data Analysis**

Data was analysed with the help of Statistical Package for Social Sciences (SPSS) version 20.0. **Objectives 1 and 5** were analysed using descriptive statistics in the form of frequency and percentages to describe the demographic characteristics of respondents and to analyse the preferred grading system as assessed by students and lecturers. Descriptive statistics was used to present data in a quantitative summary which allowed for simpler and quicker interpretation of the data. It provided understanding of the data set in detail and helped put the data in proper perspective.

**Objectives 2, 4 and 6:** Descriptive statistics in the form of means and standard deviations were used. This study employed the mean and standard deviation in the determination of:

- students' competency levels during practical training as observed by students, polytechnic lecturers and industry supervisors;



- suitability of the assessment regime designed for students on the CBT programme as assessed by lecturers and students
- adequacy level of learning facilities used in training students under the CBT as observed by lecturers and students

The standard deviation represents the distribution of the estimated students' competency levels, and the level of suitability of CBT assessment system and adequacy of learning facilities around the mean. It indicates the degree of consistency among the estimates. In other words, the standard deviation represented the degree of similarity among the estimates. A small standard deviation reflects a high degree of consensus among the respondents with respect to the estimates provided by them. In this case a small numerical range would mean (where 2/3 of the estimates/ratings fall), the response pattern among the respondents is very consistent. While a large standard deviation would indicate that there was considerable disagreement among the respondents' estimates of the students' competency levels, suitability of CBT assessment system and adequacy of learning facilities. A mean of 2.5 was used for the decision point of objective 2, while a mean of 3.0 was used for the decision points of objectives 4 and 5.

**Objective 3:** Paired t-test was used to determine students' competency levels 'before' and 'after' practical training at  $P \leq .05$ . The paired t-test was used in this study because data were taken from the same set of students before and after the practical or industrial training to determine if there was a significant difference between the mean or average scores of two experiences. It helped to determine whether the means were sufficiently different from



each other to conclude that the pre-training competencies were different from the post-training ones. Besides, it was also employed because the true population standard deviation and mean were not known and this helped account for the extra variability in estimating the true standard deviation based on the sample data. In this study, this was done by getting the average score of each group, and then getting the difference of the two means.

**Objective 7:** Kendall (1939) Coefficient of Concordance (W) was used to rank logistical constraints to competency acquisition by students as perceived by polytechnic supervisors. It is a tool that was used to assess agreement among raters with 1 as the highest constraint and 0 as the least constraint:

$$W = \frac{S}{S_{\max}}$$

Where W = Coefficient of concordance, S = Sum of ranks, S<sub>max</sub> = Sums of ranks at maximum.

### 3.6.2 Hypotheses Analysis

**HO<sub>1</sub>:** Chi-square statistics was used to analyse the data computed at  $P \leq .05$ :

$$X^2 = \frac{\sum(\text{obs} - \text{exp})}{\text{exp}}$$

**HO<sub>2</sub>:** Chi-square statistics was used to analyse the data computed at  $P \leq .05$ :

$$X^2 = \frac{\sum(\text{obs} - \text{exp})^2}{\text{exp}}$$

**HO<sub>3</sub>:** Chi-square statistics was used to analyse the data computed at  $P \leq .05$



$$X^2 = \frac{\sum(\text{obs} - \text{exp})^2}{\text{exp}}$$

**HO<sub>4</sub>:** T-test statistics was used to analyse the data computed at  $P \leq .05$

**HO<sub>5</sub>:** T-test statistics was used to analyse the data computed at  $P \leq .05$

### **3.6.3 Qualitative Data Analysis**

Yin (2009) observed that the overall goal in data analysis is to treat the evidence fairly that would assist a researcher produce compelling and analytical conclusions that give room for little alternative interpretations. Saunders, Lewis, and Thornhill, (2007) affirmed that because of its nature, there is no standardised approach to the analysis of qualitative data. Bryman (2004) added that clear cut rules related to how qualitative data should be analysed has not been established. Many strategies exist in this respect, although an analytical strategy is commonly used (Hussey and Hussey 1997). Taylor and Bogdan (1984) stated that all researchers develop their own ways of analysing qualitative data. In this regard, Yin (2003) noted that analysis consists of examining, categorising, and tabulating data. However, Flick (2007) added that the objective of qualitative data analysis is to identify, examine, compare and interpret patterns and themes. As such, there are many qualitative research traditions and approaches which supports the fact that different strategies could be employed to deal with data collected (Saunders, Lewis, and Thornhill, 2003).

In this study, qualitative data was collected on all the objectives for the study and analysed using the following procedure: Thorough reading was done of all interviews and





observation transcripts, notes and tapes, so as to gain familiarity and extensive understanding of the materials pieced together as recommended by Huberman and Miles (2002).

The next step was the categorization of the collected data, and then classifying them further into meaningful entities. This process generated three different categories. These were data for students, lecturers and industry supervisor's categories. By classifying respondents in this way, it became much easier to understand and control the raw data (Saunders *et al.*, 2003).

The categorization was followed by the unitization of the data. This was done to attach relevant aspects of data referred to as units of data to the appropriate category or categories. Units of data were made up of a number of words, a sentence, a paragraph or sometimes a complete answer to questions asked in the interview. At this stage transcripts were copied, cut up and placed into files, each containing piles of related units of data corresponding to a particular category (Saunders *et al.*, 2003). This process afforded the researcher the opportunity to reduce and rearrange the data into manageable and comprehensive form (Easterby-Smith *et al.*, 1991). However, Yin (2009) submitted that any of the following five analytical techniques could be employed to analyse data collected after interviews: these are Pattern Matching, Explanation Building, Time-Series Analysis, Logic Models, and Cross-Case Synthesis.



**Pattern Matching:** the pattern matching method is used to compare an empirically-based pattern with a predicted one. If the case matches the predicted patterns then the case supports the theory in the same way as successful experiments support a theory. If the pattern coincides, the results can help to strengthen the internal validity of a case (Yin, 2009).

**Explanation-building:** explanation-building is a special type of pattern matching. The goal of this technique is to analyse the case study data by building explanations about the case (Yin, 2009). In explanation-building processes, the findings are compared to any statement or proposition created.

**Time-Series:** the time-series technique is a special and more rigorous case of process tracing, in which the researcher attempts to establish the existence, sign and magnitude of each model link expected, and the sequence of events relating to the variables in the model (De Vaus, 2002). Yin (2009) argued that if the events over time have been traced in detail and with precision, time-series analysis techniques may be possible.

**Logic Model:** the logic model intentionally specifies a chain of events over an extended period of time. The events are in a repeated cause-effect-cause effect pattern, whereby a dependent variable (event) at an earlier phase becomes the independent variable for the next phase. This process can help define the sequence of programmatic actions that will accomplish the goals (Yin, 2009).



**Cross-Case Synthesis:** cross-case synthesis is a technique especially relevant to research consisting of at least two cases. This technique treats each individual case study as a separate case (Yin, 2009).

Based on the above different strategies that could be used for qualitative data analysis, pattern matching was employed for this study. Therefore, comparisons were made against data collected using other instruments such as the questionnaire to establish similarities and differences. This enabled the pre-determined theoretical factors which influence the quality of the CBT programme to be compared with data collected. This was done to satisfy the requirements of triangulation which seeks to enhance the clarification of issues under investigation. Saunders *et al.*, (2003) maintained that researchers who adopt analytical strategies toward qualitative data can commence deductively, where data categories are derived from theory.



## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### **Introduction**

This chapter discusses the various findings that were obtained from the field using questionnaire, interviews and observation. It focusses on a number of issues including sub-headings as demographic characteristics of respondents, effectiveness of CBT as assessed by lecturers, industry supervisors, graduates of the CBT programme and current first and second years of the programme, appropriateness of the assessment regime for the programme, adequacy of learning facilities, variation or maintenance of the grading system, and constraints of the programme. Findings from the administration of questionnaire were used to corroborate those that were obtained from interviews and observations. Empirical evidence from reviewed literature were also used to either support or contradict results obtained from the study.

#### **4.0 Demographic Characteristics of Respondents**

Students, lecturers, and industry supervisors are key stakeholders in the CBT programme, thus, it was deemed relevant to consider the socio-demographic characteristics of those who participated in the survey as presented below using Tables.

##### **4.1.1 Sex of Students:**

From the results, an overwhelming 91.8% and 84% of both first and second year students who participated in the study were males, while only 8.2% and 16% were females as



indicated in Table 4.1. The male dominance was noted by UNESCO (2012) which affirmed that gender disparity still exists among students despite the efforts made to bridge the gap between boys and girls in the area of access to science related programmes at higher levels of education.

Rajagopal and Bojin (2003) in their study reported that there were significant gender differences among male and female college and university students. However, this runs counter to the findings of Kalava, Ravindranath, Bronshteyn, Ripudaman, SchianodiCola, and Joel (2014) that majority (53%) of those who participated in a similar CBT programme for medical doctors in the United States of America were female. Research that was conducted in Accra Polytechnic to determine the performance of first year HND Secretaryship and Management students revealed that 91% of the respondents were females (Sutherland-Addy (2005) reported that female enrolment in the polytechnics in 2000/01 academic year was only 2.2%. Though the situation has since witnessed significant improvement in the 2009/10 academic year with 30% enrolment in the polytechnics being female, this is still low relative to the expected national parity ratio of 50:50 for both sex. Bunyi (2003) attributed this phenomenon to high dropout rates and poor performance of girls at both the basic and senior high levels, compelling so many girls to fall out of school.



**Table 4.1 Demographic Characteristics of First and Second Year Students**

<b>Variables</b>	<b>Categories</b>	<b>FY</b>	<b>SY</b>
<b>Sex:</b>	Male	67(91.8%)	42(84%)
	Female	6(8.2%)	8(16)
<b>Age:</b>	20-24 years	21(28.8%)	14(28%)
	25-29 years	40(54.8%)	24(48)
	30-34 years	10(13.7%)	10(20%)
	35-39 years	2(2.7%)	2(4%)
<b>Profession:</b>	Farmer	35(47.9%)	27(54%)
	Trader	32(43.8%)	9(18%)
	Salary Earner	4(5.5%)	7(14%)
	Contractor	2(2.8%)	1(2)
	Others	-	6(12%)
<b>Educational level:</b>	Tertiary	5(6.8%)	15(30%)
	Senior high	18(24.7%)	3(6%)
	Basic level	36(49.4%)	29(58)
	No education	12(16.4%)	4(4%)
	Others	2(2.7%)	1(2%)

Source: Field Survey 2014: FY – First Year Students, SY – Second Year Students

#### **4.1.2 Age of Students:**

The findings as presented in Table 4.1 revealed that students in the age bracket of 25 – 29 years for both first and second years constituted the majority of the study population representing 54.8% and 48% respectively, while those in the age bracket of 35 – 39 years were the least representing 2.7% and 4%. The findings are in line with a similar work by Saif, Khan, Rehman, Rehman, Rehman, Nawa, Naqeeb, (2013) that ages of respondents were in the range of 28 years and above. On the contrary, Arsoy and Özad (2004) found that only four out of 48 respondents were 25 years old and above in a similar study.



#### **4.1.3 Occupation of Students' Parents:**

The findings as shown in Table 4.1 indicates that farming is the main occupation of most of the parents representing 47.8% and 54% of first and second year students who were surveyed. The results confirm the study of others that majority of children were willing to take after their parents occupations (Gentry, 2013; Smith *et al.*, 2012; Igbiniedion 2011; Allen and Cowdery, 2009; and Okeke, 1996). Parents are the major socialising agents for their children and therefore transmitters of cultural values, beliefs, and traditions which are central to a child's choice of career. The implication is that most students may be pursuing the programme because of their earlier exposure to the practical aspect of it and parental influence.

#### **4.1.4 Educational background of parents:**

As indicated in Table 4.1, over 80% and 90% of the parents of first and second year students who are on the CBT programme have had some form of formal education with majority attaining basic level education. The parents of a child are his most immediate relation. Their educational status could therefore have an important influence on the personality development of the child. This affirms the assertion of Azhar, Nadeem, Naz, Perveen, and Sameen, (2013) that educated parents stand the chance of understanding the educational and attitudinal needs of their children better than the uneducated. They can support their children in their early education which may affect their proficiency in their relative area of knowledge acquisition. Parental educational background play vital role in effecting students' educational achievements. Although only 5% of their parents have had education up to the tertiary level, the findings suggests the students' determination and



resolve to achieve what their parents could not do. This is quite refreshing as the study area has high illiteracy level (*de Lang*, 2007). On the other hand, about 60% of the second years surveyed indicated that their parents have never been to school.

#### **4.1.5 Sex of Lecturers:**

The results shows that all lecturers within the Department are males as indicated in Table 4.2. Lecturers are expected to have sufficient understanding of the area being studied and the right balance of skills for effective delivery of lessons. The findings are in tandem with the sex distribution of lecturers in Ghanaian polytechnics as reported by (NCTE, 2011; Dehlor, 2006; and Amegashie, 2009). Consistent with this finding, Sutherland-Addy (2005) reported that nationally, male lecturers constituted 58.6% in 2000/01 with a corresponding female population of 41.4% nationwide. This confirms the assertion that there is a general shortage of female lecturers in science related programmes nationwide (Duodo, 2006). However, Weinberg, Basile, and Albright, 2011) found that majority (53%) of respondents in a similar study were females out of 336 participants in the United States of America.





**Table 4.2 Demographic characteristics of lecturers**

<b>Variables</b>	<b>Categories</b>	<b>Frequency</b>	<b>Percent</b>
<b>Sex:</b>	Male	10	100
	Female	-	-
<b>Age group:</b>	31 – 40years	3	30
	41 – 50years	5	50
	51 -60years	2	20
<b>Academic Qualification:</b>	Second Degree	7	70
	First Degree	1	10
	PhD	2	20
	Others	-	-
<b>Length of Service:</b>	1 – 5years	2	20
	6 – 10	2	20
	11 – 15	3	30
	16 – 20	2	20
	< 20	1	10
<b>CBT Received:</b>	Very adequate	5	50
	Adequate	3	30
	Fairly adequate	2	20
	Not adequate	0	0
<b>Knowledge in ICT:</b>	Very effective	1	10
	Effective	5	50
	Fairly effective	4	40
	Not effective	-	-

Source: Field Survey 2014

#### **4.1.6 Age of Lecturers:**

The findings indicate that about 80% of the lecturers are less than 50 years old with half of them falling within the age bracket of 41 -50 years as shown in Table 4.2. The influence of lecturers' characteristics on various training outcomes call into question what role, if any, lecturers' age play. Age plays a very important role in identifying lecturers who are best suited to adopt Competency-Based Training, and may also impact outcomes (Herschell *et*



*al.*, 2010). This is an indication that there would not be the need for them to recruit more lecturers in the not too distant future. The findings are also consistent with the research of Iddrisu, Alhassan, and Kinder, (2014) that majority (67%) of lecturers surveyed fell within 46 - 55 years. This finding corroborates the records of lecturers in polytechnics as contained in NCTE (2011). Therefore, younger workers have a higher propensity to change jobs than their older counterparts (Tetty, 2006). However, Michael *et al.*, (2005) posited that age does not differentially predict outcomes of learning.

#### **4.1.7 Lecturers Academic Qualifications:**

From Table 4.2, an overwhelming 90% of the lecturers have a minimum of second degree which is the required entry academic qualification. Academic qualifications of a teacher play a very vital role in identifying lecturers who are best suited to adopt Competency-Based Training, and may also impact outcomes (Herschell *et al.*, 2010). In a related study, Iddrisu *et al.*, (2013) established that 92% of the academic staff in Ghanaian polytechnics are in the Lecturership rank, which is the minimum entry qualification. This is a remarkable improvement from the findings of Dehlor (2006) that only 16.4% of academic staff in Ghanaian the polytechnics were in the same qualification bracket. The implication is that the lecturers within the Department have the capacity to train the students to acquire the desired competencies. This is in line with the findings of Ashcraft *et al.*, (2011) that lecturers with higher academic qualifications have more knowledge on CBT than their counterparts with less qualifications. Nakamura *et al.*, (2011) reported that lecturers with higher academic qualifications hold more positive attitudes towards CBT than those with lower qualifications.



#### **4.1.8 Experience of Lecturers:**

Majority of lecturers (80%) have been in the Department for more than six years and this is an indication that it is endowed with experienced lecturers as indicated in Table 4.2. Lecturers' years of experience play a significant role in determining learning outcomes (Herschell *et al.*, 2010). This implies that students stand to enormously benefit from their experience since majority of the lecturers have been around for some time. Learning theory predicts that job experience enhances job ability and Ehrenberg and Smith (2000) therefore suggested that job performance changes over time because individuals accumulate job experience. This confirms the findings of Stewart, Chambless, and Baron, (2012) that lecturers with more experience are more likely to engage in CBT programmes. Also, lecturers' years of experience were found to be associated with satisfactory delivery of their training sessions (Garland, Haine, and Boxmeyer, 2007).

#### **4.1.9 Training in CBT:**

All lecturers in the Agricultural Engineering Department were trained in the CBT approach to lecturing before its implementation in the polytechnic as shown in Table 4.2. Lecturers are major stakeholders in the CTB programme and organising training for them would assist to sharpen their skills in delivery. They play a significant role in equipping students with the desired industry competencies since they help in designing the curriculum, lecture, supervise and assess students. This confirms the assertion of Beutler *et al.*, (2004) that organising training for lecturers has proven to have impacted outcomes. Equally, lecturers are more likely to implement CBT when they are consistent with their own theoretical orientation (Brookman-Fraze *et al.*, 2010). However, Wampold and Brown (2005)



reported that providing training for lecturers accounted for little variability in outcome. From this study, all lecturers have professed to have had adequate training in the CBT programme which indicates that students would be sufficiently exposed to the nitty-gritties of it. However, 20% of them indicated that the level of training they received was fairly adequate and this creates a compelling case for more training workshops to be organised to help bring them up to speed.

#### **4.1.10 Knowledge in ICT:**

The results revealed that about 80% of the lecturers have knowledge in ICT that is adequate for equipping students with relevant industry skills and that is a remarkable outcome as indicated in Table 4.2. Oliver (2002) argued that ICT has fundamentally changed the practices and procedures of nearly all forms of learning activities. The field of education has been affected by ICTs, which undoubtedly affects lecturing, learning, and research (Yusuf, 2005). The implication is that it would help improve the standard of lecturing and learning, students would become independent in their studies, it would help deepen their theoretical knowledge and assist them to become creative in the world of work. Others confirm that ICT provides a catalyst for rethinking lecturing methods (Flecknoe, 2002), train the caliber of graduates required for the world of work (Kulik, 2003); and improve the quality of lecturing and learning (Wagner, 2001). ICT can assist in deepening students' content knowledge, support them to construct their own knowledge, and help unleash their potential in complex thinking skills (Kozma, 2005). However, since lecturers would have to rely so much on ICT, the 40% whose knowledge in it is fairly effective need further training in order to bring them up to acceptable standards.



#### 4.1.11 Sex of Industry Supervisors:

As revealed in Table 4.3, majority of the supervisors at the industry level are male (66.7%) relative to only 33.3% who are female. The male dominance confirms the general low females in science related programmes nationwide (Duodo, 2006). Eisenkopf, Hessami, Fischbacher, and Ursprung, (2013) reported that trainees taught by male trainers help improve their performances and strengthens their self-confidence. On the contrary, Nwana (2010) reported that the gender of a trainer had no significant effect on student-lecturers' acquisition of verbal skills. Nsa, Akpan, and Williams, (2012) in their study also revealed that the gender of a trainer does not significantly influence students' skill acquisition. Regardless of the sex of supervisors at the industry level, students can still acquire the competencies needed for the world of work.

**Table 4.3 Demographic characteristics of industry supervisor**

Characteristics	Categories	Frequency	Percent
<b>Sex:</b>	Male	18	66.7
	Female	9	33.3
<b>Age groups:</b>	20 – 30years	2	7.5
	31 – 40years	11	40.7
	41- 50years	12	44.4
	51 – 60years	1	3.7
	>60years	1	3.7
<b>Experience:</b>	<3years	3	11.1
	3-5years	9	33.3
	6-10years	10	37.0
	11-14years	2	7.4
	>14years	3	11.2
<b>Qualification:</b>	Basic certificate	-	0
	Senior high cert.	2	7.4
	Diploma	7	25.9
	Bachelor degree	13	48.2
	Master's degree	5	18.5

Source: Field Survey 2014



#### **4.1.12 Age of Industry Supervisors:**

About 80% of the supervisors at the industry level were less than 50 years old with 44.4% of them falling within the age bracket of 41 -50 years as indicated in Table 4.3. As reported by Herschell *et al.*, (2010), age plays a very important role in recognising trainers who are best suited to adopt Competency-Based Training, and may also impact outcomes. However, Michael *et al.*, (2005) posited that age does not differentially predict outcomes. Age determines how individuals change over time which subsequently may affect job performance (Waldman and Avolio, 1993). Its potential detrimental effects may include decreased ability levels, harsher evaluations, or decreased motivation (Sturman, 2003). A non-linear relationship between age and performance should be expected as employees grow older (Avolio, Waldman, and McDaniel, 1990). Age has been found to be associated with decreases in performance on tests of learning, memory, reasoning, spatial abilities, and psychomotor speed (Verhaeghen and Salthouse, 1997).

#### **4.1.13 Type of industry:**

The study also considered the type of industry students had their practical training important because they have the potential to enhance the development of trainee's competencies. The CBT is implemented in the Agricultural Engineering Department and students are required to be equipped with competencies that are relevant to that area. Thus, it is not surprising that all the students in that Department had their practical training with agricultural related organisations as indicated in Table 4.3. To this end, students would have the opportunity to actually acquire what is required of them to enable them to effectively function in the world of work. The polytechnic environment alone does not



have the capacity to provide students with these competencies since Technical, Vocational and Education and Training (TVET) institutions lack workshops, tools and equipment and where present, machinery is often decades old and bears little resemblance to that currently used by industry (MOESS, 2008). However, Kirkpatrick and Kirkpatrick (2006) asserted that lack of suitable training facilities could affect trainees' motivation to learn. Places that have the potential for distractions, inappropriate temperature as well as venues that would require long distance travels should not be considered (Bimptos and Petridou, 2012). Brown and McCracken (2009) argued that perceived absence of opportunity to learn and physical logistical constraints could negatively impact learning.

#### **4.1.14 Experience of industry supervisors:**

Experience involves the accumulation of job-related knowledge acquired through actions, practices, and perception of tasks and duties associated with a specific job (Quiñones, Ford, and Teachout 1995). Founded on perceptions and practices, experience is essentially tied to time, whose passage allows for the accumulation of job-related competencies. Sturman, (2003) observed that with regard to human capital theory, employees make investments of experience in themselves, which enhances their ability, and thus influence job performance. Trainers' years of experience play a significant role in determining learning outcomes (Herschell *et al.*, 2010). As shown in Table 4.3, over 90% of supervisors at the industry level have been in their organisations for more than five years which is an indication that they are endowed with wealth of experience that could be relevant for the training of students. Since job experience leads to accumulation of relevant knowledge, skills, and abilities, performance would ultimately improve. It influences job knowledge



and task proficiency, which in turn has a positive effect on job performance. This implies that students stand to benefit enormously from the experience of supervisors since majority of them have been around for some time. This confirms the findings of Stewart *et al.*, (2012) that mentors with more experience are more likely to engage in CBT programmes. Also, supervisors' years of experience were found to be associated with satisfactory delivery of their training sessions (Garland *et al.*, 2007).

#### **4.1.15 Academic Qualifications:**

Academic qualifications of supervisors at the industry level were also investigated because it could play a very vital role in identifying those who are best suited to adopt Competency-Based Training, and may also impact outcomes (Herschell *et al.*, 2010). Table 4.3 indicates that over 60% of supervisors have a minimum of first degree with none educated to only the basic level. The implication is that supervisors within these organisations have the capacity to train the students to acquire the desired competencies. This is in line with the findings of Ashcraft *et al.*, (2011) that trainers with higher academic qualifications have more knowledge on CBT than their counterparts with lower qualifications. Nakamura *et al.*, (2011) reported that lecturers with higher academic qualifications hold more positive attitudes towards CBT than those with lower qualifications. However, since some of the competencies require hands-on training, over reliance on formal academic qualifications may not be able to achieve the needed results. Thus, a balanced approach involving practicals and theory could provide the desired outcome.





#### **4.4. CBT effectiveness as assessed by Students, Lecturers and Industry Supervisors**

CBT as assessed by students, lecturers and industry supervisors have had a profound effect on students acquisition of industry desired competencies since the mean of means scores for each of the investigated items was more than the expected 2.5 in this study as shown in Table 4.4. The overall mean of means scores of 2.70 implies that the CBT is effective in equipping students with the needed competencies that would enable them to effectively function in the world of work.



**Table 4.4 Assessment of CBT by Students, Lecturers and Industry Supervisors**

<i>Desired Competencies</i>	<i>PS</i>	<i>IS</i>	<i>FY</i>	<i>SY</i>	<i>M/Ms</i>
Problem-solving skills in the world of work	2.56	2.56	3.37	2.60	2.77
Critical thinking skills	2.37	2.41	3.10	2.52	2.67
Knowledge of socio-economic demands at work place	2.58	2.53	3.31	2.56	2.72
Ability to transfer skills learnt to practical situations	2.64	2.53	3.24	2.58	2.72
Knowledge of interpersonal skills at work place	2.60	2.59	3.15	2.62	2.74
Self-confidence	2.75	2.56	3.37	2.52	2.80
Ability to network in a variety of situations	2.75	2.45	3.30	2.52	2.76
Ability to self-reflect situations	2.67	2.54	3.33	2.56	2.78
Knowledge of ICT skills needed for work place	2.81	2.34	3.33	2.56	2.76
Awareness of leadership skills needed to lead others	2.84	2.57	3.33	2.54	2.80
Group decision making through consensus	2.79	2.58	3.33	2.54	2.81
Organise ideas clearly in an outline	2.77	2.52	3.30	2.53	2.78
Ability to know and handle different sides to an issues	2.74	2.53	3.16	2.51	2.74
Ability to work methodically	2.67	2.55	3.11	2.56	2.72
Capacity to deal with changes outside comfort zone	2.79	2.44	3.32	2.57	2.78
Possesses theoretical agricultural knowledge	2.71	2.64	3.34	2.50	2.80
Possesses practical agricultural knowledge	2.73	2.54	3.38	2.63	2.82
Skills to work with people from diverse cultures	2.90	2.53	3.18	2.64	2.81
Being able to handle different activities at work place	2.70	2.59	3.28	2.66	2.79
<b>Mean of Means</b>	<b>2.70</b>	<b>2.53</b>	<b>3.28</b>	<b>2.56</b>	<b>2.77</b>

Measured as: Very Competent – 4, Competent - 3, Fairly Competent – 2, and Not Yet Competent – 1: Source: Field Survey 2014:



**Legend:** PS – Polytechnic Supervisors, IS – Industry Supervisors, FY – First Year Students, SY – Second Year Students, and M/Ms – Mean of Means

Though the mean of means scores for each competency item studied was above 2.5, the individual means for “critical thinking skills” as assessed by lecturers (2.37) and industry supervisors (2.41) did not meet the required benchmark for the study. Therefore, the mean of means score of 2.67 was influenced more by the assessment of students whose mean scores were 3.36 and 2.52 respectively. Consequently, if scores for first year students are considered outliers, the mean of means score for that item would fall short of the expected 2.5. Thus, concerted efforts should be made to adequately expose students to all relevant simulation and other practical activities that would support them acquire this skill.

While students and lecturers assessed recipients of the training to be competent in the other competency items, industry supervisors assessed them to be not yet competent in their ‘ability to network (2.45), knowledge in ICT skills (2.34), and capacity to deal with changes outside their comfort zones (2.44). Despite the fact that their individual mean of means scores exceeded the required 2.5, more quality time and resources need to be directed towards these competency items to enable students to attain them.

Findings in this study also revealed that the highest mean of means score was recorded in the competency item of ‘practical agricultural knowledge (2.82), while ‘critical thinking skills (2.67) recorded the lowest. The highest score for ‘practical agricultural knowledge’ may not only be attributed to the training received on the programme, but could be as a result of some exposures students had from families and friends since the polytechnic does



not have a farm for practicals as indicated in Table 4.8. This also confirms the findings in Table 4.1 that majority of parents of students are engaged in farming.

Out of the 19 industry desired competencies studied, supervisors from the polytechnic assessed students to be competent in 18 whose mean scores were above 2.5 as indicated in the Table 4.4. Students were assessed to be more competent in “skills to work with people from diverse cultures” with a mean score of 2.90, while “critical thinking skills” recorded the least competency score of 2.37. This confirms the findings of other studies that the CBT model is capable of equipping learners with industry desired competencies (Brantuo *et al*, 2014; Boahin, 2013; Ayarkwa *et al.*, 2012; Oledede *et al.*, (2011; and Oloruntoba, 2008). However, students were rated to be not yet competent in critical thinking as the score of 2.37 was less than the required mean of 2.5. From this study, it is obvious that the CBT model effectiveness in providing learners with desired competencies is not in doubt per the Polytechnic’s supervisors’ assessment.

The quantitative data in this study corroborates views expressed by some of the lecturers who participated in the interview session. CBT has the potential of clothing trainees with the requisite skills needed to function effectively in the world of work. A lecturer in the Agricultural Engineering Department had this to say:

*“.....the programme is useful and has the capacity to equip students with the desired skills. Students have the opportunity to learn hands-on skills before entering the job market. The industrial attachment aspect of the programme makes it possible for students’ to network with potential employers, thereby increasing their chance of being employed after completion” (IDI, 2014)*



Another lecturer in the Department also presented that:

*“.....CBT has the ability to assist students acquire skills that other forms of training may not. Its emphasis on practicals makes it possible for students to acquire and apply skills learnt in the working environment. From my experience, some students virtually work with machines they used in school, while others only need some small level of training to bring them up to speed” (IDI, 2014)*

This researcher visited to observe some of the practical training sessions on the polytechnic campus and observed that most students were able to undertake tasks that were expected of them. It was observed that students could service and maintain tractors in one of the training sessions. Some students even demonstrated their capacities to work with people from diverse backgrounds, build consensus, and to work methodically among others.

The supervisors from the polytechnic are lecturers in the Agricultural Engineering Department and it is important to elicit their views on the effectiveness of CBT on students' acquisition of industry desired competencies. In an interview however, a supervisor at the industry level explained that:

*“.....the supervisors from the polytechnic only visit the students once throughout the practical training period which lasts for three months. They hardly spend quality time observing students perform tasks in the world of work. They assess students by asking questions and using responses from industry supervisors and students after about one hour visit to where students are undertaking this practical training” (IDI, 2014)*

Wesselink *et al.*, (2012) proposed that the right lecturers for the CBT programme should be those who have part time jobs with industry or full time lecturers with academic institutions and should be made to periodically update their competencies through retraining.



Though supervisors' assessments are vital in determining the effectiveness of the CBT, they need to spend more quality time with students during practical training to enable them to provide a reliable measure of students' competencies. As noted by Kolb and Kolb, (2005), CBT is an experiential learning programme and its assessment needs to be authentic. Cumming and Maxwell, (1999) posited that authentic assessment underpins the concept of Competency-Based Training which is directly linked to performance of tasks undertaken in the world of work. It requires the physical presence of assessors' to supervise the entire activity, not just the final product or isolated elements of it (Oledele *et al.*, 2011). Wiggins, (1990), noted that assessment is deemed authentic when students' performances are directly assessed while they are undertaking a defined task. Leduchowicz (2007) indicated that there should be more contact between trainers and trainees' to ensure its success. Thus, the mode of assessment employed by the polytechnic supervisors during practical training will not be able to pass authenticity test. In an interview, a former student recommended that:

*“.....the mode of assessment employed by the Polytechnic lecturers to supervise students on practical training need to be reviewed and modified for it to provide the desired outcomes” (IDI, 2014)*

As indicated in Table 4.4, out of the 19 industry desired competencies studied, supervisors at the industry level assessed students to be competent in 15 whose mean scores were 2.5 and above. Students were assessed to be more competent in “possessing theoretical agricultural knowledge” with a mean score of 2.64, while “theoretical agricultural knowledge” recorded the least competency score of 2.50. This is in consonance with similar outcomes that were established in other investigations (Boahin, 2013; Thobega *et*



*al.*, 2011; Wesselink *et al.*, 2010; and Osei, Berchie, Ansah, Gyasi-Boakye, Asante, and Adjekum, 2005). However, students were found not to be competent in the areas of critical thinking skills, ability to network in a variety of situations, knowledge of ICT skills needed in the world of work and capacity to deal with changes outside their comfort zones. Thus, quality time should be spent in those areas to enable them to acquire such skills.

The supervisors at the industry level play a pivotal role in the training of students on the CBT and it is important to elicit their views on the effectiveness of CBT on students' acquisition of industry desired competencies. These supervisors are expected to train and assess students within the three months of their stay with them. They spend quality time with students where they perform tasks in real work setting. They assess students by observing, mentoring and asking questions that would facilitate students' acquisition of demand-driven competencies. As expressed by Kolb and Kolb (2005) CBT is an experiential learning programme and its assessment need to be authentic. Cumming and Maxwell, (1999) posited that authentic assessment underpins the concept of Competency-Based Training which is directly linked to performance of tasks undertaken in the world of work. It requires the physical presence of assessors to supervise the entire activity, not just the final product or isolated aspects of the activity (Oledele *et al.*, 2011). Wiggins, (1990), noted that assessment is deemed authentic when students' performances are directly assessed while they are undertaking a defined task. Thus, the mode of assessment employed by the industry supervisors during practical training provide students with the wealth of competencies so much desired by industry.



In an interview, a supervisor at the workplace, presented that:

*“.....the Polytechnic has not provided any in-service training for us the supervisors at the industry level who also have the responsibility of training and assessing students under our jurisdictions. There is no organised platform that would bring together all relevant stakeholders on the CBT programme to enable us share our experiences” (IDI, 2014)*

Another supervisor at the industry intimated that:

*“.....we are not involved in the design and implementation of the assessment process. Students come with forms for us to assess them. We need to share notes as to the way forward” (IDI, 2014)*

One of the interviewees suggested that:

*“.....since the supervisors at the industry level contribute substantially towards the success of the programme, efforts should be made to organise regular interaction forums to assist all partners share their experiences” (IDI, 2014)*

My field work trip to some of the industries revealed that students were actually engaged in the business of trying to understand and apply what was expected of them. Some students used the combine harvester to harvest rice at SARI; others were able to use the tractor to till the lands of lecturers for farming.

Findings also indicated that students were found to be competent in all the 19 competencies investigated as assessed by first and second years as shown in Table 4.4. First year students were assessed to be competent more in practical agricultural knowledge and less competent in critical thinking skills with means of 3.38 and 3.10 respectively. Second year students were assessed to be more competent in “skills to work with people from diverse cultures”





with a mean score of 2.64, while “Ability to know and handle different sides of issues” recorded the least competency score of 2.51. It could therefore be concluded that the training has significantly increased the competence of students in the competency areas assessed. This is in line with the findings of (Brantuo, Cristofalo, Meheš, Ameh, Brako, Opoku, 2014; Jeffrey 2013; Oloruntoba 2008; Madebwe and Madebwe, 2005; Bodmer *et al.*, 2002; and Cabrera *et al.*, 2001) that students’ practical year programme provided students with ‘hands-on’ experience and opportunity to apply theory learnt in the classroom to real work situation where they adapted and provided solutions to problems on the field.

In line with this, some former students who were interviewed indicated that the programme is capable of providing students with hands-on skills. An interviewee presented that:

*“I am able to work very well because of the training I received from the CBT. Some superiors may not have enough time to mentor you at work, but your experience could help. I work with minimum supervision because I was adequately exposed to potential occupational challenges during my training in school” (IDI, 2014)*

Another former asserted that:

*“.....CBT exposed me to normal work settings. I am able to work well with people from different places, network well and agree and disagree with others” (IDI, 2014)*

Another graduate of the programme indicated that:

*“.....The CBT made me self-employed. I am on my own because I can operate the machines I am using. I manage my employees well because of my leadership skills, team spirit and my readiness to work with anybody around the globe” (IDI, 2014)*



#### **4.5 Students Competency levels before and after practicals as assessed by first years**

Student's competencies were ascertained by asking them to state their levels of competence in 19 competency items that are needed to function effectively in the world of work. A survey was conducted at the beginning and at the end of the practical training programme. The results of paired t-test computed at  $p \leq 0.5$  presents an assessment before and after practical training among students in terms of competencies acquired was founded on the score of students that participated in the programme, regardless of the type of organisation this exercise was carried out. The study assumed that a mean score of 2.5 and above represents 'competent' while a mean score of below 2.5 represents 'not yet competent'. The mean score of 2.5 was obtained by adding all the values that represented the four point scale of 4 = very competent, 3 = competent, 2 = fairly competent and 1 = not yet competent which summed up to 10 and this was further divided by their number, (4) to produce the mean score of 2.5

The results as presented in Table 4.5 indicate that out of the 19 competency items examined, significant differences were found among all industry desired competencies. Students recorded higher competence mean score after the practical training than the score before the training. It could, therefore, be concluded that the training has significantly increased the competence of students in the competency areas assessed. The findings also corroborate the studies of (Boahin, 2013; Thobega *et al.*, 2011; and Oledede *et al.*, 2011; Mohd, Mohd, Norhisham, 2009; Osei *et al.*, 2005; and Madebwe and Madebwe, 2005) on similar practical training programmes.



The results also indicate that students were competent before undertaking the practical training programme in “theoretical agricultural knowledge” and “practical agricultural knowledge” out of the 19 competency items investigated. This is an indication that the practical training programme may not solely have been responsible for the changes in their competency levels. These changes could possibly be attributed to the practical training received at the polytechnic or at home provided by parents who might have demonstrated such competencies to their children on their farms.

**Table 4.5 Competencies levels of students before and after industrial attachment training**

<i>Desired Competencies</i>		<i>M</i>	<i>N</i>	<i>S.D</i>	<i>T</i>	<i>Df</i>	<i>P</i>
Problem-solving skills in the world of work	Before	2.29	73	.716	10.17	72	.000
Problem-solving skills in the world of work	After	3.37	73	.613			
Critical thinking skills	Before	2.32	73	.685	9.230	72	.000
Critical thinking skills	After	3.36	73	.674			
Knowledge of socio-cultural demands at work	Before	2.29	73	.697	-7.657	72	.000
Knowledge of socio-cultural demands at work	After	3.21	73	.666			
Ability to transfer skills to practical situations	Before	2.25	73	.703	7.999	72	.000
Ability to transfer skills to practical situations	After	3.14	73	.631			
Knowledge of interpersonal skills for work	Before	2.41	73	.761	-6.149	72	.000
Knowledge of interpersonal skills for work	After	3.15	73	.593			



Self confidence	Before	2.42	73	.686	-9.560	72	.000
Self confidence	After	3.38	73	.592			
Ability to network in a variety of situations	Before	2.38	73	.659	-8.774	72	.000
Ability to network in a variety of situations	After	3.30	73	.594			
Ability to self-reflect actions	Before	2.41	73	.663	-7.370	72	.000
Ability to self-reflect actions	After	3.33	73	.647			
Knowledge of ICT skills for work	Before	2.44	73	.666	-8.395	72	.000
Knowledge of ICT skills work	After	3.33	73	.625			
Awareness of leadership skills to lead others	Before	2.36	73	.788	-9.062	72	.000
Awareness of leadership skills to lead others	After	3.36	73	.632			
Group decision making through consensus	Before	2.26	73	.834	-8.848	72	.000
Group decision making through consensus	After	3.33	73	.554			
Organise and express ideas clearly	Before	2.36	73	.806	-8.449	72	.000
Organise and express ideas clearly	After	3.30	73	.594			



Ability to know and handle different issues	Before	2.30	73	.758	-8.465	72	.000
Ability to know and handle different issues	After	3.16	73	.601			
Ability to work methodically	Before	2.41	73	.663	-6.363	72	.000
Ability to work methodically	After	3.11	73	.636			
Capacity to deal with changes	Before	2.40	73	.702	-9.097	72	.000
Capacity to deal with changes	After	3.32	73	.598			
Possesses theoretical agricultural knowledge	Before	2.55	73	.688	-7.654	72	.000
Possesses theoretical agricultural knowledge	After	3.34	73	.650			
Possesses practical agricultural knowledge	Before	2.54	73	.687	-8.818	72	.000
Possesses practical agricultural knowledge	After	3.37	73	.565			
Skills to work in diverse cultures	Before	2.42	73	.725	-6.851	72	.000
Skills to work in diverse cultures	After	3.18	73	.631			
Perform different activities at work	Before	2.40	73	.702	-7.914	72	.000
Perform different activities at work	After	3.22	73	.583			

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Measured as: Very Competent – 4, Competent - 3, Fairly Competent – 2, and Not Yet Competent – 1: P < .05 level: Source: Field Survey 2014



#### **4.6 Suitability of CBT assessment system as assessed by Lecturers and Students**

The suitability level of assessment components were assessed by students on the CBT using a four point scale. The study assumed that a mean score of 2.5 and above represents 'suitable' while a mean score of below 2.5 represents 'not suitable'. The mean score of 2.5 was obtained by adding all the values that represented the four point scale of 4 = very suitable, 3 = suitable, 2 = fairly suitable and 1 = not suitable which summed up to 10 and this was further divided by their number, 4 to produce the mean score of 2.5.

Out of the six assessment components, students and lecturers assessed all of them to be suitable with mean of means score of 2.75 as indicated in Table 4.6 which exceeded the expected score of 2.5. Students and lecturers assessed the practicals component to be the most suitable among all of them which had mean of means score of 2.84, while mid semester recorded the least in terms of its suitability to the CBT programme with a mean of means score of 2.62 respectively. It therefore stands to reason that students must have adequate time to practise to enable them to acquire and demonstrate requisite knowledge and skills. This confirms the findings of Hansen (2006) that practicals are essential in developing skills and the application of theoretical knowledge, create opportunities for team skills training, and offer a non-threatening environment for unskilled students to reduce their probable mistakes.

Smith (2010) posited that assessing learners against pre-defined criteria has the potential to limit the judgment of the assessor on competencies outside the prescribed ones, yet relevant for innovation and subsequent application at the workplace. It is therefore apparent



that effective and time tested skills cannot be assessed by using the modular approach which determines ones competency level at the end of each module, but this requires reliable feedback from multiple sources over a reasonable period of time (Guthrie, 2009). Competencies therefore, could be assessed based on a person's ability to demonstrate skills, understand the essential principles and its effective application at the work setting. The assessment process is also seen as being too labour intensive and time consuming because of its over-reliance on structured observations, check-lists and rating scales (Hellwig, 2006). It is against these concerns that lecturers and industry supervisors need to acquire high-level skills and qualifications for effective delivery of CBT (Smith, 2010).

It was observed that though students rated the practicals component of the assessment to be more suitable in assisting them acquire the desired competencies, the polytechnic does not have a farm for that purpose. A former student explained that:

*“.....practicals are conducted on the personal farms of lecturers during the farming season. More so, mid semester exams are also organised in the traditional fashion. It is too theoretical, and should give way to more hands-on activities such as practicals, presentations and class assignments among others” (IDI, 2014)*



**Table 4.6. Assessment suitability of CBT as assessed by Students and lecturers**

<i>Assessment components</i>	<i>FY</i>	<i>SY</i>	<i>PS</i>	<i>M/Ms</i>	<i>Decision</i>
Mid semester	2.62	2.64	2.60	2.62	Suitable
Presentations	2.73	2.71	2.64	2.69	Suitable
Practicals	2.95	2.60	2.97	2.84	Suitable
Class test	2.85	2.86	2.63	2.78	Suitable
End of Semester exam	2.90	2.56	2.78	2.75	Suitable
Assignments	2.84	2.84	2.75	2.81	Suitable
<b>Mean of Means</b>	<b>2.815</b>	<b>2.71</b>	<b>2.73</b>	<b>2.75</b>	<b>Suitable</b>

Source: Field Survey 2014: 4 = very suitable, 3 = suitable, 2 = fairly suitable and 1 = not suitable: **Legend:** FY – First Years, SY – Second Years, and PS - Polytechnic Supervisors.

#### **4.7 Variation or Maintenance of Grading System as determined by Lecturers and Students**

The study sought to obtain from both lecturers and students whether the grading system for the CBT programme as it is being practised in Tamale Polytechnic should be varied or maintained. From the results, 70% and 74% of the first and second year students respectively prefer a variation in the grading system, while 30% and 26% of the same groups favour the status quo as indicated in Table 4.7. To them, their competencies defer and simply grading students as ‘competent’ or ‘not yet competent’ is not fair. The current grading system is not rewarding enough and therefore has the potential of discouraging hard work and stifling initiative.





It was revealed in an interview that since the inception of the CBT, no student in the Department has ever won the best graduating student award, and that could be demotivating to hard working students. A former student observed that:

*“.....our competencies may defer in terms of speed, accuracy, presentation, problem-solving, among others, but differences in all these should be recognised”. (IDI, 2014)*

A lecturer also added that:

*“.....by grading students only as ‘competent’ or ‘not yet competent’ could be a disincentive to hard working students who would like to be recognised. Some training institutions may like these differentiations to enable them take decisions on students’ admissions” (IDI, 2014)*

This is in corroboration with other findings that superior performers should be separated from average ones (Torr, 2008; DEEWR, 2007), training institutions can use it for admission (Williams and Bateman, 2003), and nothing prevents grading beyond this dichotomy (McGraw, 1993). Grading policy decisions should depend on its effect on learning, requirements of learning institutions and industry since this can harm enthusiasm of students (Byrne 1993), employers should acknowledge and reward excellence (VEETAC, 1993), train or learn beyond work, and stop favouring only the skills needed for work today (Wheelahan, 2008), as this can create a sense of failure in less naturally able students (Toop, 1993).

The results also indicate that 60% of lecturers within the Department are in support of the current grading system as shown in Table 4.7. The results is in line with the assertion of some researchers that under the CBT, there should be no grading of results, only a simple



judgement of 'yes you have satisfied the required standards' or 'no, you have not met the standards yet' should be used (CWCC, 1993; Fletcher, 1992). The 'no/yes' decision normally denotes Pass/Fail; Satisfactory /Unsatisfactory; Competent/Not yet competent among others.

In a follow up interview by this researcher, lecturers submitted that one is either judged 'competent' or 'not yet competent' based on the person's ability to undertake a specified task. One lecturer argued that:

*".....it is about the individual's performance against defined standards and not competition among students" (IDI, 2014)*

Another lecturer contended that:

*".....introducing these variations into the grading system would amount to a re-introduction of the rejected norm-referenced grading system which is seen to be unsuitable for the development of industry desired competencies" (IDI, 2014)*

Competence as a concept is experiencing an on-going process of continuous change for the generation of varied thoughts and models. Harris (2006) observed that this could be attributed to changes in technology, organisational restructuring and labour market demands. NCVER (2003) contended that the underlying characteristics do not only include knowledge and skills which are the most easy to develop, but they also include attitudes, values and self-concepts as well as traits and motives, which are part of a person's core personality and therefore difficult to describe and develop. While one could be trained to secure skills and knowledge, a number of the other attributes are more challenging to assess and develop, and that it would be effective to choose for them. Thus, we could be training



for and assessing the less difficult variables, but there may be problems if judgements are not made about the most critical aspects of competence at work. Whether in training, selection or performance management, judgements about good and bad will be made about peoples' competence. These judgements should be based on sound evidence. So the critical issue is how much can formal training through training models contribute to good judgements about people, and their skills, knowledge and attributes? Indeed, competence is a journey as well as context-reliant. It goes beyond prescribed education and training and incorporates all life experiences which have been acquired over a period of time. Therefore, CBT must be approached in an integrated manner in order to derive the benefits of other equally important learning methods. Officialising competency in a qualification or statement of achievement is a point-in-time decision where one is either competent or not yet competent in assessment.

Under the CBT programme, information on the number of re-sits allowed and whether the re-sit results could affect a student's final grade received a rather unfamiliar response. The traditional norm reference grading system in Ghana has a defined number of times re-sits are allowed in most institutions where the credit hours are doubled to negatively affect the final grade. However, a student who is judged not yet competent under the CBT as practiced in Tamale Polytechnic has limitless number of times to re-sit and this does not have any effect on the final grade. Karran (2005) reported that institutions have different policies on re-sit exams and in Italy for instance, students have the right to accept the marks obtained or can choose to re-sit for the same paper even if they have not failed for more than once.



In Denmark, however, if students fail, they are given three more attempts. Attempts missed are stated on students' score sheets, but does not count towards the final grade. Thus, when students realise that they are not likely to get a good grade in a course, they can choose to give back a blank sheet which gives them a score of zero, and rather opt to re-sit the examination. If a student is unable to pass in three attempts, the university can give such a person dispensation based on individual judgments. After four attempts, the university has to gain permission from the Ministry to allow another re-sit, but this is granted more or less automatically. In Ghana, Finland, Germany and Latvia, there are no common national rules about re-sitting exams, and universities provide their own regulations, although normally students can re-sit twice.

In an interview with a lecturer in the Department, he stated that:

*“.....a student can re-sit exams until such a time he is deemed competent” (IDI, 2014)*

The findings of the study runs counter to the traditional system where a student would miss the opportunity to graduate if he is unable to pass all his papers before the third year after his graduation.



**Table 4.7 Preferred Grading System as determined by Students and Lecturers**

<b>Preferred Grading Systems</b>	<b>PL</b>	<b>SY</b>	<b>FY</b>
Competent = 50 - 100, not yet competent = < 50	6(60%)	15(30%)	19(26%)
Very competent = 80 - 100, competent = 65 – 79, fairly competent 19 - 50 – 64, not yet competent = less than 50	4(40%)	19(38%)	41(56%)
Distinction = 75 -100, credit = 65 - 74, pass = 50 - 64, fail = less than 50	-	7(14%)	5(7%)
First class, 75 -100, second class upper = 70 – 74, second class lower = 65 - 69, pass = 50 – 64	-	9(18%)	8(11%)
<b>Totals</b>	<b>10(100)</b>	<b>50(100)</b>	<b>73(100)</b>

Field survey: 2014

**Legend:** PL - Polytechnic lecturers, SY - Second Year Students, FY - First Year Students

#### **4.8 Adequacy of Learning Facilities for CBT as assessed by Students and lecturers**

The adequacy levels of the various learning facilities were assessed by Polytechnic lecturers and students using means. A mean score of 2.5 and above was used to denote “adequate,” while a score of less than 2.5 was used to denote “inadequate.” Out of the six learning facilities studied, supervisors at the Polytechnic and students assessed all to be inadequate since the 2.31 mean of means score is less than the expected 2.5 as indicated in Table 4.8 below.



**Table 4.8 Adequacy of Learning facilities as assessed by Students and lecturers**

<i>Learning Facilities</i>	<i>FY</i>	<i>SY</i>	<i>PS</i>	<i>M/Mns</i>	<i>Decision</i>
ICT centre for training	2.21	2.33	2.28	2.27	Inadequate
Farmlands for practicals	2.24	2.31	2.36	2.30	Inadequate
Machines for practicals	2.31	2.42	2.29	2.30	Inadequate
Simulation centres	2.32	2.27	2.25	2.28	Inadequate
Library with materials	2.27	2.34	2.28	2.34	Inadequate
Workshops for practicals	2.41	2.38	2.32	2.37	Inadequate
<b>Mean of means</b>	<b>2.29</b>	<b>2.34</b>	<b>2.30</b>	<b>2.31</b>	Inadequate

Field survey 2014: Measured as: Very adequate – 4, adequate – 3, fairly adequate – 2, inadequate – 1: **Legend:** FY – First Years, SY – Second Years, PS - Polytechnic Supervisors, M/Ms – Mean of Means

With mean of means score of 2.27 as assessed by students and lecturers, ICT facilities are seen to be inadequate in the polytechnic and that has the potential of negatively impacting CBT's effectiveness. Indeed, the polytechnic currently has about hundred computers for a student population of over 8,000 (TPSP, 2013). However, effective ICT training centres could have enormous positive impact on students' ability to transfer skills learnt to practical situations because of its ability to expose them to realities in the world of work (Kulik, 2003). Flecknoe (2002) opined that ICT provides a catalyst for rethinking and lecturing methods.

An effective ICT system would expose students to work place related challenges prior to their graduation and this could assist them to handle similar issues in the future. As submitted by Kozma (2005), ICT can assist in deepening students' content and practical knowledge, and help unleash their potential in solving complex issues in the world of work. Yusuf (2005)



concluded that the field of education has been affected by ICTs, which have undoubtedly affected lecturing, learning, and research. ICT provides a platform for students to contact one another, share ideas and information that would be of help to them. It has broken distance barriers and has become a vehicle for students around the globe to link up with other people for the sharing and use of information. Though some students have their own laptops, the programme could be made more effective if the Department is able to have its own computer laboratory.

Farmlands which are major resources for practicals also recorded mean of means score of 2.30 as assessed by students and lecturers. The Polytechnic currently does not have a farmland for practicals training and this development is worrying since theories taught in lecture rooms cannot be practically learnt. This confirms the assertion of Ansah and Ernest (2013) that several years of poor resource allocation to the educational sector has negatively impacted skills development in Ghanaian educational institutions. Gondwe and Walenkamp (2011) reported that the actual content of programmes does not address the needs of the workplace unless it is accompanied by real work related practice. Availability of farmlands for students to learn and practise what is being taught would support them handle problems that may confront them in the world of work since they would be exposed to all manner of challenges. Students would be armed with skills of how to handle group problems, leadership issues, machines breakdown, time management and consensus building among others. In an interview with a former student, he stated that:

*“.....we used not to have farmlands for practicals and this was a big challenge. Practical were done on the farms of lecturers. The*



*computer lab is for the whole school and we were not allowed to practice at our own time” (IDI, 2014)*

The above statement corroborates the findings of Dogru (2008) that practicals taught at the appropriate place could assist students develop problem-solving skills. Equally, Kirkpatrick and Kirkpatrick (2006) submitted that the availability of these facilities could help a trainee realise full potential. The polytechnic need to take reasonable steps to acquire land for that purpose since practical sessions would help build work related skills in students. In the interim, parcels of land that are not currently in use could be used for that purpose until a permanent solution is found.

The study also revealed that relevant machines needed for the training of students to acquire the much needed skills are insufficient in the polytechnic. With mean of means score of 2.30 by students and lecturers, machines used in training students are deemed to be inadequate. This is in line with the assertion of Bimptos and Petridou (2012) that learners could acquire the required competencies if designated places for lecturing and learning are stocked with the right machines, free from distractions as well as having the right climate for practicals training. To this end, Kirkpatrick and Kirkpatrick (2006) argued that the absence of appropriate machines and equipment could affect the motivation of learners. Charney and Conway (2005) asserted that the instructor should inspect the training location and rearrange all relevant machines for easy movement and training at the designated place.

Sufficient and relevant machines for practicals provide students the opportunity to apply theories learnt in class. This would assist them understand concepts relevant to their area





of study, thereby being able to organise and express their ideas clearly in a desired outline when the need arises. The training provides them with greater level of confidence to be able to organise and express themselves clearly better than their counterparts who did not have such training. This confirms the findings of Ofori (2000) that students are sufficiently assertive and are always keen in establishing one-to-one discussions with lecturers and colleague employees. They look for reasons, justification, and logic behind ideas (Sadler-Smith, 1996). In the same vein, (Omar, Kofli, Mat, Darus, Osman, and Rahman, 2008) posited that students are satisfied with the training received and have admitted improvements in their personal attitude, communication and attitude to work after the CBT programme.

Another in the Agricultural Engineering Department a lecturer explained that:

*“.....we are even scared of using some of the machines because they are not insured. We do not have an old tractor again to teach the students reversed engineering on some components” (IDI, 2014)*

Simulation centres which are also central to the success of the CBT were deemed to be inadequate with mean of means score of 2.28 as assessed by students and lecturers. The polytechnic currently has one which is being locked up, and given its importance to the programme, steps should be taken to put it in to use. A visit to the polytechnic workshop revealed that the few simulation machines the institution has acquired are kept in boxes and locked, and are only brought out when they are to be used. As posited by Akiode *et al.*, (2010), CBT considers physical learning facilities such as modern skills and simulation laboratories as essential enhancements to lecturing and learning. Cole (2002) stressed that



case studies and simulations are useful training tools that should be effectively employed to enhance skills acquisition. This study concludes that simulations would assist students self-reflect their strengths and weaknesses and to determine what could be done to enable them to perform better. Simulations would expose students to potential difficulties they may encounter in the real working environment and design strategies that would improve their performances. The implication is that relevant simulation exercises have the potential of exposing students to different job related activities, thereby helping them acquire varied skills necessary for the world of work. Thus, sufficient simulation activities need to be undertaken to help develop into students varied skills that are needed for effective performance in the real work setting.

The research showed that with a mean of means score of 2.34 as assessed by students and lecturers, the library in the polytechnic has inadequate materials for effective lecturing and learning. The implication is that both students and lecturers do not have access to relevant lecturing and learning materials which are necessary ingredients for CBT's success. It is expected that effective library would improve standard of lecturing and learning, deepen theoretical knowledge of students, and assist them become creative workers in the world of work. Besides, a library stocked with relevant learning materials could also help students better understand concepts and theories taught in the classroom, consequently, its contribution to theoretical knowledge. It is asserted that libraries with effective ICT's provide a catalyst for rethinking lecturing methods (Flecknoe, 2002), train the caliber of graduates required for the world of work (Kulik, 2003); and improve the quality of lecturing and learning (Wagner, 2001). Libraries with modern ICT's can assist in



deepening students' content knowledge, support them to construct their own knowledge, and help unleash their potential in complex thinking skills (Kozma, 2005).

The study established that with a mean of means score of 2.37 as determined by students and lecturers, the Polytechnic does not have adequate workshops for students on the CBT. A personal visit to the site indicated that the place is used as both a workshop and a lecture room. The implication is that the workshop is not conducive for effective lecturing and learning. Practical lessons organised in suitable workshops provide students the chance to share ideas, respect each other's opinions, race, religions and ethnicity of colleagues (Bimptos and Petridou, 2012). As Storr and Hurst (2001) indicated, the right facilities such as learning space, classrooms, and other learning resources that are required for good training should be functional and comfortable. Brown and McCracken (2009) observed that perceived absence of opportunity to learn and physical logistical constraints could negatively impact learning. Thus, the workshop in the polytechnic needs to be well stocked with the relevant and sufficient tools and equipment needed for the CBT programme in order to help students acquire the much needed competencies for the world of work.

The researcher conducted an observation, and findings from the practicals conducted on their lecturers farms corroborate the findings from both the interviews and and administration of questionnaire bearing in mind the variables in this study. Besides, most machines were not insured, thereby making it difficult for both students and lecturers to use.



#### 4.9 Constraints of the CBT programme as assessed by polytechnic lecturers

The constraints working against the smooth running of the Competency-Based Training programme in Tamale Polytechnic as assessed by lecturers were ranked using Kendall's Coefficient of concordance (W) statistics as shown in Table 4.9. The findings ranked difficulties students encounter in trying to find places for attachment as the top most constraint with a mean of 9.49. The polytechnic is located in the regional capital, Tamale, where limited opportunities exist for these students to undertake practical training exercise. This supports the Ministry of Education, Science and Sports (MOESS, 2008) data that pre-employment institution-based training finds it hard to connect with industry, to arrange staff and trainees for industrial placements and to get industry representation on institution boards. Bekunda, Okori, and Kyamanywa, (2007) posited that there is minimum interface between training institutions and industry to expose students to realities of learning programmes to enable learners to acquire the needed competencies. As a result of this ineffective collaboration between the polytechnic and the private sector, mechanisms have to be put in place to help lessen these challenges that bedevil the programme. This was espoused by a supervisor at the industry level that:

*“.....so many students come here every year looking for places to do their attachments, but because my place is small, I am unable to engage many of them” (IDI, 2014)*

Again, students have a daunting task finding accommodation during this practical training period and that accounts for its mean rank of 9.39. Most students are from backgrounds that are not financially sound, thus, are unable to undertake this practical training in areas where land lords charge higher prices. The period for the training is three months and



owners of accommodation do not see it attractive renting property to students when so many fully employed people within the same area could be looking for it. It is therefore not surprising that accommodation was rated second as an impediment to the effective implementation of the CBT programme. In line with this, a graduate of programme presented that:

*“.....I could not do my attachment at my first choice because I did not have money to rent to rent to stay. Most of my friends suffered the same fate” (IDI, 2014)*

It was also revealed that the programme also suffer from inadequate budgetary allocation from the polytechnic. Funds for practical training supervision are paid by students which from all indications is inadequate and that could be responsible for its mean score of 9.24. Lecturers are not provided with transportation to undertake these exercises and the ₵50 given to them for accommodation and transportation is not sufficient to fuel their own cars. Government does not contribute anything as far as the supervision of students is concerned. It is therefore not surprising that incomes generated can only enable lecturers to supervise students only once throughout the practical training period which lasts for three months. Though a fraction of what students pay is expected to take care of students and lecturers insurance, it was revealed in an interview that this rarely happens and some organisations even reject students for practical training who do not have insurance covers. This development confirms the assertion of Duodo (2006) that practical training programmes suffer from inadequate placement opportunities, lack of insurance for both trainees and supervisors, and other financial incentives such as night allowances. As remarked by one of the lecturers in the AED:



*“.....we face enormous challenges procuring funds for the CBT programme. At times we do not even get financial releases on time to purchase fuel for practicals for supervision of students”. (IDI, 2014)*

Thus, for CBT to be responsive to the needs of industry, a financing framework need to be modelled taking into consideration all the relevant issues that would make it effective. Currently, it is only the students who bear the cost and if other stakeholders such as the industry, non-governmental organisations and government could be brought into the financing equation, the programme stands the chance of succeeding.

Also, the current workshop designed for practical training within the polytechnic serves as a lecture hall for the first years. In one of my visits to the Department, it was observed that the only workshop used for training students has a lot of machines and equipment and these occupy more than half of the space in that structure, leaving only a fraction of it for lectures. With this arrangement, any year group that has practicals would have to use the same place where noise distraction and other disruptions could affect the smooth delivery of lecturing and learning. Thus, the only workshop designed for practicals training and simulation in the Agricultural Engineering Department, is used as a lecture hall and that accounts for why it recorded a mean rank of 9.10 as a constraint to the effective implementation of the CBT programme. This confirms the position of MOESS (2008) that Technical, Vocational Education and Training (TVET) institutions lack workshops, tools and equipment and where present, the machinery is often decades old and bears little resemblance to that currently used by industry in the twenty first century.



Kirkpatrick and Kirkpatrick (2006) asserted that lack of suitable training facilities could affect trainees' motivation to learn. Places that have the potential for distractions, inappropriate temperature as well as venues that would require long distance travels should not be considered (Bimptos and Petridou, 2012). Storr and Hurst (2001) also indicated that the right facilities and resources, learning space, classrooms, and other learning resources that are required for good training should be functional and comfortable. Brown and McCracken (2009) perceived that absence of opportunity to learn and physical logistical constraints could negatively impact learning. However, the current constraints could soon become a thing of the past since there is an on-going project meant to house the whole of the School of Engineering which includes the Agricultural Engineering Department.

Another constraint that has the potential of working against the effective implementation of CBT is the use of unqualified staff to train students. Currently, most of the lecturers in the Department have undergone training in CBT either within the polytechnic, or in the Netherland (NUFFIC, 2008). The Department has 16 lecturing staff and except one, the rest have minimum of second degree which is the required entry qualification (TPSP, 2013). This explains why "Inadequate skilled staff to teach and supervise students" is seen as one of the least harmful constraints to CBT with a mean rank of 8.07. The availability of qualified staff could probably be responsible for students being assessed competent in most competency items since they play a pivotal role in CBT both within and outside the polytechnic. This is in line with the assertion of Kirkpatrick and Kirkpatrick (2006) that the trainers' qualities should include sound knowledge in the training area, a good listener, a desire to train, good communication skills, and excellent talent to motivate trainees to



participate in the training process. Also, Massey (2003) added that training standards requires that trainers should have the ability to transfer skills and knowledge to the trainee. Lawson (2006) argued that the trainer's physical presence in terms of appearance, lecturing, and his ability to communicate could affect trainees' perceptions of the training, and this could inspire them to maximise their job-related skills and knowledge. From the findings, the polytechnic therefore has sufficient qualified staff capable of providing students with the right training so much desired by industry.

Since '1' represents a perfect concordance and '0' no concordance in the study of Kendall (1939), the lecturers have agreed among themselves that the investigated factors have reasonable but not super high extent with regard to the constraints of the CBT programme as Kendall's  $W = 0.53$  and significant at  $p \leq .002$ .





**Table 4.9 Constraints of the CBT programme as ranked by lecturers**

<b>Constraints</b>	<b>Mean Rank</b>	<b>Rank</b>
Difficulty finding places for attachment	9.49	1
Lack of accommodation for students on attachment	9.39	2
Inadequate budget for industrial attachment	9.24	3
Limited number of workshops for training	9.10	4
Limited time for mentoring students	9.05	5
Limited number of computers	9.04	6
Lack of effective transportation system	8.73	7
Limited practicals for fear of machines breakdown	8.36	8
Untimely release of funds for supervision	8.33	9
Inadequate skilled staff to teach and supervise	8.07	10
Inadequate learning modules	8.04	11

Sample size (N) = 73, Kendall's W = 0.53, Chi-Square = 16.147, df = 14, Asymptotic significance = .002, Rank 1 = Highest Constraints, Rank 10 = Least constraint  
Source: Field Survey 2014

#### **4.10.0 Hypotheses Testing**

**4.10.1 Ho<sub>1</sub>: There would not be any significant association between selected demographic characteristics of students on CBT and their acquisition of competencies as assessed by first year students.**

In this section, null hypotheses were tested to ascertain their acceptance or rejection as shown in Table 4.10. To establish the significance of the relationship between student's demographic characteristic and their acquisition of industry desired competencies as assessed by first year students, data collected was subjected to a Pearson chi-square test for



association. At a degree of freedom (9), there is a statistically significant relationship between students' ages and their problem-solving skills which is a competence required by industry, given that the asymptotic level of sig. (.043) is less than the predetermined level of confidence ( $P \leq 0.05$ ). This therefore leads to the conclusion that there is a significant relationship between ages of students and their problems-solving skills in the world of work. Consequently, the null hypotheses was therefore rejected. This finding supports the work of Brown (2009) who established that selected demographic characteristics of students have profound effect on their skills acquisition. Matured students have been reported to achieve greater academic success, as measured by final degree GPA, compared to younger ones (Sheard, 2009; McKenzie and Gow, 2004).

The findings also revealed that there is a statistically significant relationship between demographic characteristics of students and their acquisition of industry desired competency of ability to transfer skills learnt to practical situations. At a degree of freedom of (9), it was found that there is a statistically significant relationship between profession of parents of students and their ability to transfer skills learnt to practical situations, given that the asymptotic level of sig. (.032) is less than the predetermined level of confidence ( $P \leq .05$ ). The results present a picture that parent's profession have a significant impact on students' ability to transfer skills learnt to practical situations. This corroborates the findings of other researchers that there was a significant relationship between parents' occupation and a student's career choice and performance (Gentry, 2013; Smith *et al.*, 2012; and Igbinedion, 2011).



Selected demographic characteristic of students' age was also found to have a significant relationship with industry desired competency of self-confidence. With a degree of freedoms of (9) and (12), there was a statistically significant relationship between ages of students and the educational background of their parents on one hand, and their self-confidence on the other hand, given that their asymptotic levels of significance of (.005) and (.021) are less than the predetermined level of confidence ( $P \leq 0.05$ ) as indicated in Table 4.10. This therefore means that ages of students and the educational background of their parents could influence their self-confidence. This results is in line with the findings of other works that older students have greater level of confidence due to their experience of life, the world of work and that appears to distinguish them from their younger counterparts (Azhar, *et al.*, 2013; Shanahan, 2006; Ofori, 2000).

The study also reported a significant relationship between (ages) and students' ability to acquire industry desired competencies (ability to network in a variety of situations). At a degree of freedom of (9), it was found that there is a statistically significant relationship between ages of students and their ability to network in a variety of situations, given that the asymptotic level of significance of (.026) is less than the predetermined level of confidence ( $P \leq .05$ ). From the study, age has a profound impact on one's ability to network in a variety of situations. As reported by McKenzie and Gow, (2004), older students have higher levels of achievement motivation, willingness to work, persistence, critical reflection, internal locus of control, self-efficacy and zeal to network.



Findings in this research also revealed a significant relationship between ‘educational background of parents’ and their acquisition of industry desired competencies of ‘theoretical agricultural knowledge’. With a degree of freedom of (9), it was found that there is a statistically significant relationship between educational background of parents and students theoretical knowledge in agriculture, given that the asymptotic level of significance of (.040) is less than the predetermined level of confidence of ( $P \leq .05$ ). This implies that students from parents’ higher educational backgrounds stand the chance of acquiring more theoretical knowledge in agriculture than their colleagues from parents with relatively lower educational backgrounds. This affirms the assertion of Azhar, *et al.*, (2013) that educated parents stand the chance of understanding the educational and attitudinal needs of their children better and can support their children in their early education which may affect their proficiency in their relative area of knowledge and educational achievements.

From the study, there is also a significant relationship between ‘occupation of parents’ and students acquisition of industry desired competency of ‘practical agricultural knowledge’. At a degree of freedom of (9), it was found that there is a statistically significant relationship between occupation of parents and students practical knowledge in agriculture, given that the asymptotic level of significance of (.032) is less than the predetermined level of confidence of ( $P \leq .05$ ). The implication of this finding is that students whose parents are in to agricultural activities are more likely to have prior practical knowledge in that area than their colleagues who are not. The findings confirm the study of Okeke (1996) who reported that majority of students were willing to take after their parents occupations



because of their early exposure to such professions. Igbinedion (2011) reported that there was a significant relationship between parents' occupation and a student's career choice. The parents influence could lead to student progress in terms of attendance, more positive attitudes, better grades, increased motivation, and higher test scores (Gentry, 2013). Based on these findings, the null hypotheses should be accepted and the alternate rejected.

The results found no significant relationship between the selected demographic characteristics of student and industry desired competencies of critical thinking skills, knowledge of socio-cultural demands at work, interpersonal skills relevant at the work place, ability to self-reflect actions, knowledge of ICT skills needed for the work place, awareness of leadership skills needed to lead others, group decision making through dialogue and consensus, organise and express ideas clearly in an outline, ability to know and handle different sides of issues, ability to work methodically, skills to work with people from diverse cultures, and ability to perform different activities at work place. These variables recorded asymptotic levels that are higher than the predetermined confidence interval of ( $P \leq .05$ ). The implication is that industry desired competencies could be influenced by those variables were found to be significant and not all the variables that were investigated. This therefore calls in to question whether these competencies can actually solve the skills gap problems that industries are confronted with. Smith, (2010) posited that assessing learners against pre-defined criteria has the potential to limit the judgment of the assessor on competencies outside the prescribed ones, yet relevant for innovation and subsequent operations at the workplace. Wheelahan (2008) submitted that we must train or learn beyond work, and stop favouring only the skills needed for work to



the detriment of other less instant but potentially significant knowledge which may be of use to the learner.

**Table 4.10. Relationship between students' demographic characteristics and their acquisition of industry desired competencies as assessed by students**

Dep. Variables	Indep. Variables	X <sup>2</sup>	Df	P-V	D
Problem-solving skills	Age	17.598	9	.043	S
Self confidence	Age	23.751	9	.005	S
Ability to network	Age	16.968	9	.026	S
Ability to transfer skills	Parent's profession	17.445	9	.032	S
Practical agricultural knowledge	Parent's profession	18.387	9	.032	S
Theoretical agricultural knowledge	Parent's education	22.252	12	.040	S

Source: Field Survey 2014:  $P < 0.05$  level: S = Significant, NS = Not Significant

**4.11.2 Ho<sub>2</sub>: There would not be any significant relationship between the demographic characteristics of lecturers and students competencies as assessed by Lecturers.**

To establish the significance of the relationship between lecturers' demographic characteristic and industry desired competencies as assessed by them, data collected was subjected to a Pearson chi-square test computed at  $p \leq 0.05$  for association as indicated in Table 4.11. With a degree of freedoms of (6) for each of them, it was found that there was a statistically significant relationship between lecturers length of service and CBT received on one hand, and their problem-solving skills on the other hand, given that their asymptotic



levels of significance of (.041) and (.047) are less than the predetermined level of confidence ( $P \leq .05$ ). The implication is that lecturers years of experience and lecturing skills acquired through the CBT could assist them deliver lessons efficiently, thereby, providing students with industry desired competencies. This confirms the findings of other researchers that lecturers with more experience are more likely to engage in CBT programmes where their years of experience were found to be associated with satisfactory delivery of their training sessions (Stewart *et al.*, 2012 Brookman-Fraze *et al.*, 2010; Garland *et al.*, 2007; Beutler *et al.*, 2004). (Wampold and Brown (2005) reported that training for lecturers accounted for little variability in outcome.

This study also revealed significant relationship between lecturers' demographic characteristic 'age and academic qualification' and students' acquisition of industry desired competencies 'critical thinking skills'. The influence of lecturers' characteristics on various training outcomes call into question what role if any lecturers' age and academic qualifications play. At a degree of freedoms of (6) for each of them, it was found that there was a statistically significant relationship between lecturers ages and academic qualifications on one hand, and students acquisition of critical thinking skills on the other hand, given that their asymptotic levels of significance of (.031) and (.046) are less than the predetermined level of confidence ( $P \leq .05$ ). Age and academic qualifications play a very important role in identifying lecturers who are best suited to adopt Competency-Based Training, and may also impact outcomes (Herschell *et al.*, 2010). This supports the findings of earlier works that lecturers with higher academic qualifications have more knowledge on CBT than their counterparts with lower qualifications (Ashcraft *et al.*, 2011;



Nakamura *et al.*, 2011). However, Michael *et al.*, (2005) posited that age does not differentially predict outcomes.

The findings also established that there is significant relationship between lecturers demographic characteristics 'length of service' and students' acquisition of industry desired competency of 'ability to transfer skills learnt to practical situations'. With a degree of freedom of (6), it was found that there was a statistically significant relationship between lecturers' length of service and students' ability to transfer skills learnt to practical situations, given that asymptotic level of significance of (.043) is less than the predetermined level of confidence ( $P \leq .05$ ). The implication is that lecturers' years of experience could assist them deliver lessons efficiently, thereby, providing students with the much needed industry desired competencies. This confirms the findings of (Stewart *et al.*, 2012; Garland *et al.*, 2007) that lecturers with more experience are more likely to engage in CBT programmes.

The study has also shown that there are significant relationships between lecturers' demographic characteristics 'age and academic qualification' and students' acquisition of industry desired competency of 'self-confidence'. At degree of freedom of (6) for each of them, it was found that there was a statistically significant relationship between lecturers ages and academic qualifications on one hand, and students self-confidence on the other hand, given that their asymptotic levels of significance of (.034) and (.027) are less than the predetermined level of confidence ( $P \leq .05$ ). This upholds the assertion of Herschell *et al.*, (2010) that age plays a very important role in identifying lecturers who are best suited





to adopt Competency-Based Training, and may also impact outcomes. Ashcraft *et al.*, (2011) also affirmed that lecturers with higher academic qualifications have more knowledge on CBT than their counterparts with lower qualifications. Nakamura *et al.*, (2011) reported that lecturers with higher academic qualifications hold more positive attitudes towards CBT than those without it.

Findings in this study also revealed a significant relationship between lecturers' demographic characteristic of 'knowledge in ICT' and students' acquisition of industry desired competency of 'ability to network in a variety of situations'. With a degree of freedom of (6), it was found that there was a statistically significant relationship between lecturers knowledge in ICT and students ability to network in a variety of situations, given that its asymptotic levels of significance of (.026) is less than the predetermined level of confidence ( $P \leq .05$ ). This suggests that a lecturer's knowledge in ICT has bearing on students' ability to network in variety of situations. This affirms the findings of others that ICT provides a catalyst for rethinking lecturing methods and networking (Flecknoe, 2002), train the caliber of graduates required for the world of work (Kulik, 2003), and improve the quality of teaching and learning (Wagner, 2001). ICT can assist in deepening students' networking capabilities, content knowledge, support them to construct their own knowledge, and help unleash their potential in complex thinking skills (Kozma, 2005).

The study also indicated a significant relationship between lecturers' demographic characteristic of 'knowledge in ICT' and students' acquisition of industry desired competency of 'knowledge in ICT relevant for the world of work'. At a degree of freedom



of (6), it was found that there was a statistically significant relationship between lecturers knowledge in ICT and students' knowledge in ICT relevant for the world of work, given that its asymptotic levels of significance of (.028) is less than the predetermined level of confidence ( $P \leq .05$ ). The inference is that it would help improve standard of lecturing and learning, students would become independent in their studies, it would help deepen their theoretical knowledge and assist them become productive workers in the world of work. The finding is in consonance with the assertion of Oliver (2002) that ICT has fundamentally changed the practices and procedures of nearly all forms of learning activities. The field of education has been affected by ICTs, which undoubtedly affected lecturing, learning and research (Yusuf, 2005).

From the study, there is also a significant relationship between lecturers' 'academic qualification' and students' acquisition of industry desired competency 'possesses theoretical agricultural knowledge'. At a degree of freedom of (6), it was found that there was a statistically significant relationship between lecturers academic qualification and students acquisition of theoretical agricultural knowledge relevant for the world of work, given that its asymptotic level of significance (.022) is less than the predetermined level of confidence ( $P \leq .05$ ). The inference from this is that students stand to gain relevant and sufficient theoretical agricultural knowledge from lecturers who have the required academic qualifications. This supports the findings of Ashcraft *et al.*, (2011) that lecturers with higher academic qualifications have more knowledge on CBT than their counterparts with lower qualifications. Equally, Nakamura *et al.*, (2011) also reported that lecturers with



higher academic qualifications hold more positive attitudes towards CBT than those with lower qualifications.

Results from the study also indicated that there is a significant relationship between lecturers' 'competence based training received' and students' acquisition of 'practical agricultural knowledge'. At a degree of freedom of (6), it was found that there was a statistically significant relationship between lecturers training received in competency based programme and students acquisition of practical agricultural knowledge relevant for the world of work, given that its asymptotic level of significance of (.039) is less than the predetermined level of confidence ( $P \leq .05$ ). This therefore suggests that lecturers with sufficient training on the competency base programme are well equipped to assist students acquire the industry needed practical agricultural knowledge. This confirms the assertion of Beutler *et al.*, (2004) that organising training for lecturers has proven to have impacted outcomes. Equally, lecturers are more likely to implement CBT when they are consistent with their own practical and theoretical orientation (Brookman-Fraze *et al.*, 2010). Based on these findings, the null hypotheses should be accepted and the alternate rejected.

The results found no significant relationship between some of the selected demographic characteristics of lecturers and students acquisition of industry desired competencies of Knowledge of socio-economic demands at work, knowledge of interpersonal skills at work place, ability to self-reflect situations, awareness of leadership skills needed to lead others, group decision making through dialogue and consensus, organise ideas clearly in an outline, ability to know and handle different sides of an issue, ability to work methodically,



ability to work methodically, skills to work people from diverse cultures, and being able to handle different activities at work place. They all recorded asymptotic levels that are higher than the predetermined confidence interval of ( $P \leq .05$ ). The implication is that industry desired competencies could be influenced by other variables aside those that have been investigated in the study. This therefore calls into question whether these competencies can actually solve the skills gap problems that industries are confronted with. Smith, (2010) posited that assessing learners against pre-defined criteria has the potential to limit the judgment of the assessor on competencies outside the prescribed ones, yet relevant for innovation and subsequent operations at the workplace. Wheelahan (2008) also submitted that we must train or learn beyond work, and stop favouring only the skills needed for work to the detriment of other less instant but potentially significant knowledge which may be of use to the learner.

There is also an on-going debate concerning the value of generic as against organisationally desired competency programmes. Other researchers intimated that the uniqueness of every organisation weakens the significance of Competency-Based Training programmes (Shippmann *et al.*, 2000; Zaugg and Thom, 2003). Brown and McCracken, (2009) stated that though CBT has been implemented in several countries for so many years now, industries are in continuous hunt for workers with the capacity to combine technical with employability skills for effective involvement at the place of work. As Koenigsfeld (2007) submitted, success in one organisation does not automatically translate into success in other organisations because of the level of differences that exist among them. Competency-Based Training programmes are not intended to be an end products, but are rather a starting



point for organisations seeking to develop an organisationally specific model (Wills, 1993). Competencies that are organisationally specific are rarely if ever, published, as they are considered trade secrets by many firms (Jeffery, 2013). To this end, the competencies acquired should be able to make graduates flexible, innovative and to adjust properly in diverse work settings (Neilson, 2007).

**Table 4.11. Relationship between lecturers' demographic characteristics and students acquisition of industry desired competencies as assessed by polytechnic supervisors**

Dep. Variables	Indep. Variables	X <sup>2</sup>	Df	P-v	D
Problem-solving skills	Length of Service	18.388	6	.041	S
Critical thinking Skills	Age	13.346	6	.031	S
Ability to transfer skills	Length of Service	12.835	6	.043	S
Self confidence	Age	11.345	6	.034	S
Self confidence	Qualification	14.125	6	.027	S
Ability to network	Knowledge in ICT	13.111	6	.026	S
Theoretical agricultural knowledge	Qualification	12.494	6	.022	S
Practical agricultural knowledge	CBT training	13.294	6	.039	S

Source: Field Survey 2014:  $P < 0.05$  level: S = Significant, NS = Not Significant

**4.12.3 H<sub>03</sub>: There would not be any significant relationship between demographic characteristics of industry supervisors and students acquisition of desired competencies.**

To establish the significance of the relationship between industry supervisors' demographic characteristic and students' acquisition of desired competencies as assessed by them, data collected was subjected to a Pearson chi-square test computed at  $p < 0.05$  for



association as indicated in Table 4.12. With a degree of freedom of (6), it was found that there was a statistically significant relationship between industry supervisors age and students acquisition of problem-solving skills, given that the asymptotic level of significance (.035) is less than the predetermined level of confidence ( $P \leq .05$ ). The implication is that supervisors' socio-demographic characteristics could enhance students' acquisition of industry desired competencies. This supports the findings of Almekhleh, (2013) that trainers' years of experience were found to be associated with satisfactory delivery of their training sessions. Equally, trainers' years of experience play a significant role in determining learning outcomes (Bhatii *et al.*, 2013. However, Michael *et al.*, (2005) posited that trainers' age does not differentially predict outcomes.

In the same vein, experience of industry supervisors revealed significant positive relationship with students' acquisition of industry desired competence of self-confidence. With a degree of freedom of (6), it was found that there was a statistically significant relationship between industry supervisors age and students acquisition of problem-solving skills, given that the asymptotic level of significance of (.035) is less than the predetermined level of confidence ( $P \leq .05$ ). This implies that the experience of a trainer could have a huge impact on students' acquisition of self-confidence required for the world of work. This is in tandem with the findings of Garland *et al.*, (2007) that supervisors' years of experience were found to be associated with satisfactory delivery of their training sessions. Equally, Stewart *et al.*, (2012) asserted that mentors with more experience are more likely to provide satisfactory delivery of CBT programmes.



The study also indicated a positive significant relationship between ages of industry supervisors and their ability to provide students with skills that would enable them to handle different activities in the world of work. With a degree of freedom of (6), it was found that there was a statistically significant relationship between industry supervisors age and students acquisition of problem-solving skills, given that the asymptotic level of significance of (.035) is less than the predetermined level of confidence ( $P \leq .05$ ). The implication is that the age of a supervisor at the industry level could significantly determine the acquisition of industry desired skills by students. This is in consonance with the assertion of Herschell *et al.*, (2010) that age plays a very important role in recognising trainers who are best suited to adopt Competency-Based Training, and may also impact outcomes. Equally, age determines how individual change over time which subsequently may affect job performance (Waldman and Avolio, 1993). However, Michael *et al.*, (2005) posited that age does not differentially predict outcomes.

The research also revealed a significant positive relationship between experience of industry supervisors and their ability to provide students with the relevant skills needed to handle different activities in the working environment. With a degree of freedom of (6), it was found that there was a statistically significant relationship between industry supervisors age and students acquisition of problem-solving skills, given that the asymptotic level of significance of (.035) is less than the predetermined level of confidence ( $P \leq .05$ ). Employees make investments of experience in themselves, which enhances their ability, and thus influence job performance (Sturman, 2003). This also confirms the findings of Stewart *et al.*, (2012) that mentors with more experience are more likely to



engage in CBT programmes. Also, supervisors' years of experience were found to be associated with satisfactory delivery of their training sessions (Garland *et al.*, 2007). Based on these findings, the null hypotheses should be accepted and the alternate rejected.

**Table 4.12 Relationship between industry supervisors demographic characteristics and students acquisition of industry desired competencies as assessed by industry supervisors**

Dep. Variables	Indep. Variables	X <sup>2</sup>	Df	P-v	D
Problem-solving skills	Age	18.388	6	.035	S
Self confidence	Experience	11.345	6	.041	S
Able to handle different activities	Age	15.455	6	.026	S
Able to handle different activities	Experience	14.365	6	.032	S

Significant @  $p < 0.05$ , Source: Field Survey 2014

**4.13.4 Ho<sub>4</sub>: There would not be any significant difference in the preferred grading system for the CBT as assessed by lecturers and students.**

The general supposition is that students under the CBT should be graded using the criterion referenced and not the norm referenced system. In Tamale Polytechnic, students are rated either competent or not yet competent based on their ability to execute a given task. With criterion-referenced grading, a learner's achievement is measured relative to defined standards that are based on a range of knowledge acquired from no expertise to desired performance. A student's achievement level lies at a point on this continuum resulting from performance where learners are awarded grades that are independent of others. Criterion-





referenced is employed because assessors are expected to measure students' performance against specified standards and not against each other's achievements.

In this study, the possibility was ascertained using t-test statistics to determine if there is any significant difference in their preferred grading systems. Table 4.13 shows the results of t-test statistics between lecturers and students preferred grading systems as reflected in their mean scores of 2.42 and 5.47 respectively. The differences in their mean scores is also statistically significant at 5%. The implication is that lecturers and students sharply disagreed on the grading system used for the CBT. While lecturers support the current grading system ('competent' and 'not yet competent'), students are of the view that variations in their competency levels should be identified and recognised to serve as an incentive to hard working ones. DEEWR (2007) concurred that there should be a distinction between 'thresholds' and 'differentiating' competencies, which separate superior from average performer. Torr (2008) explained that grading is a tool many people find valuable, more especially training institutions, students, employers or lecturers. Many employers want better information to help them make decisions when recruiting people. Students would like their level of work and successes graded to help them get employment or further their studies, whereas lecturers could see it as a means to motivate their students to learn as much as possible.

Williams and Bateman (2003) posited that training institutions could use grading systems for award purposes, whilst other learning institutions like the polytechnics could use it in their selection process. McGraw (1993) also added that there is nothing in a competency-



based system which prevents the introduction of grading beyond this dichotomy. Byrne (1993) asserted that grading policy decisions should depend on factors such as the motivational effect of higher grades, its effect on learning, the pressure from commerce and industry, and the requirements of learning institutions for more information for the purposes of competitive admission and employment. Since there is a significant difference between the preferred grading systems, the null hypotheses is therefore rejected.

**Table 4.13 Differences in their preferred grading system as assessed by polytechnic Lecturers and first year Students**

<i>Variables</i>	<i>M</i>	<i>N</i>	<i>S.D</i>	<i>T</i>	<i>DF</i>	<i>P</i>	<i>Decision</i>
Preferred grading system (L)	2.42	73	.779	-16.610	72	.000	S
Preferred grading system (S)	5.47	73	1.385				

Significant @  $P < 0.05$  level, L = lecturers, S = Students, Source: field survey 2014

**4.14.5 HO<sub>5</sub>: There would not be any significant differences in student’s competencies as assessed by polytechnic lecturers and industry supervisors**

The main objective of the CBT programme is to equip students with industry desired competencies. Training institutions are expected to partner with industry to realise this objective. Therefore, both the polytechnic and industry are required to teach, mentor and assess students all in the spirit of providing them with industry desired competencies. However, it is highly likely that assessment of students’ competencies by polytechnic lecturers and industry supervisors could produce different outcomes. In this study, the possible difference between polytechnic lecturers’ assessment of students’ competencies



and supervisors at the industry level was determined using t-test statistics computed at ( $p < .05$ ).

The findings as shown in Table 4.14 shows that apart from the competency item of 'problem-solving skills in the world of work' which indicated no difference with a mean score of 2.56 for both industry supervisors and polytechnic lecturers, there are differences in all the other variables. Statistically significant differences were found between assessment by supervisors and polytechnic supervisors: ability to network in a variety of situations with mean scores of 2.54 and 2.75 and the others as shown in Table 4.14.

The implication of this is that the competency levels as assessed by lecturers and industry supervisors have authenticity problems. The supervisors from the Polytechnic are lecturers in the Agricultural Engineering Department and it is important to elicit their views on the effectiveness of CBT on students' acquisition of industry desired competencies. However, it is significant to note that these supervisors from the polytechnic only visit the students once throughout the practical training period which lasts for three months. Therefore, the Polytechnic supervisors hardly spend quality time observing students perform tasks in the world of work. They assess students by asking questions and using responses from industry supervisors and trainees after about one hour visit to where students are undertaking this practical training.

Though supervisors' assessments are vital in determining the effectiveness of the CBT, they need to spend more quality time with students during practical training to enable them



to provide a reliable measure of students' competencies. On the contrary, industry supervisors are expected to train and assess students within the three months of their stay with them. They spend quality time with students where they perform tasks in real work setting. They assess students by observing, mentoring and asking questions that would facilitate students' acquisition of demand-driven competencies. As noted by Kolb and Kolb, (2005), CBT is an experiential learning programme and its assessment needs to be authentic.

Cumming and Maxwell, (1999) posited that authentic assessment underpins the concept of Competency-Based Training which is directly linked to performance of tasks undertaken in the world of work. It requires the physical presence of assessors' to supervise the entire activity, not just the final product or isolated elements of it (Oledele *et al.*, 2011). Wiggins (1990) also noted that assessment is deemed authentic when students' performances are directly assessed whiles they are undertaking a defined task. Leduchowicz (2007) indicated that there should be more contact between trainers and trainees' to ensure its success. A cursory consideration of the results also indicates a relatively higher scores in assessments done by lecturers and that calls for a concerted effort to streamline the system. The differences in means was not by chance, hence, the null hypotheses is rejected.

**Table 4.14 Differences in students competencies as assessed by polytechnic lecturers and industry supervisors**

<i>Variables</i>	<i>M</i>	<i>N</i>	<i>S.D</i>	<i>T</i>	<i>DF</i>	<i>P</i>
Problem-solving skills in the world of work (IS)	2.56	73	.799	.000	72	1.00



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Problem-solving skills in the world of work (PS)	2.56	73	.577			
Critical thinking skills (IS)	2.51	73	.690	1.320	72	.191
Critical thinking skills (PS)	2.37	73	.514			
Knowledge of socio-economic demands (IS)	2.53	73	.689	.435	72	.665
Knowledge of socio-economic demands (PS)	2.58	73	.599			
Ability to transfer skills learnt to practicals (IS)	2.53	73	.765	.905	72	.369
Ability to transfer skills learnt to practicals (PS)	2.64		.695			
Knowledge of interpersonal skills (IS)	2.53	73	.689	.698	72	.488
Knowledge of interpersonal skills (PS)	2.60		.661			
Self-confidence (IS)	2.44	73	.833	1.136	72	.260
Self-confidence (PS)	2.56	73	.527			
Ability to network in a variety of situations (IS)	2.45	73	.746	2.836	72	.006
Ability to network in a variety of situations (PS)	2.75	73	.683			
Ability to self-reflect actions (IS)	2.54	73	.707	2.093	72	.040
Ability to self-reflect actions (PS)	2.67	73	.625			

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Knowledge of ICT skills needed for work (IS)	2.34	73	.786	3.771	72	.000
Knowledge of ICT skills needed for work (PS)	2.81	73	.661			
Awareness of leadership skills needed (IS)	2.47	73	.647	3.056	72	.003
Awareness of leadership skills needed (PS)	2.84	73	.687			
Group decision making through dialogue (IS)	2.58	73	.705	1.979	72	.052
Group decision making through dialogue (PS)	2.79	73	.645			
Organise ideas clearly in an outline (IS)	2.52	73	.709	2.208	72	.030
Organise ideas clearly in an outline (PS)	2.77	73	.698			
Ability to handle different sides to issues (IS)	2.53	73	.709	1.733	72	.087
Ability to handle different sides to issues (PS)	2.73	73	.646			
Ability to work methodically (IS)	2.55	73	.688	2.114	72	.038
Ability to work methodically (PS)	2.67	73	.647			
Capacity to deal with changes (IS)	2.44	73	.623	3.625	72	.001
Capacity to deal with changes (PS)	2.79	73	.645			

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Theoretical agricultural knowledge (IS)	2.64	73	.632	.608	72	.545
Theoretical agricultural knowledge (PS)	2.71	73	.656			
Possesses practical agricultural knowledge (IS)	2.54	73	.552	2.813	72	.006
Possesses practical agricultural knowledge (PS)	2.73	73	.629			
Skills to work in diverse cultures (IS)	2.53	73	.728	3.326	72	.001
Skills to work in diverse cultures (PS)	2.90	73	.627			
Able to handle different activities at work (IS)	2.59	73	.690	1.925	72	.058
Able to handle different activities at work (PS)	2.70	73	.594			

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IS=Ind. Supervisors, PS = Poly. Supervisors, Sign. @ P<0.05, Source: Field Survey 2014



## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary of Findings

The Competency-Based Training programme is popular with industry, academic institutions, and policy makers, but there is little evidence regarding its capacity to equip students with industry desired competencies in Ghana. The objective of this research was to inform theory and practice within the field of human resource development and to contribute to the ongoing debate on the effectiveness of the CBT programme in equipping students with industry desired competencies. Organisations depend on competencies in selecting, recruiting, promoting, developing and replacing employees. Equally, industry use competencies in developing standards for certifications and designations. Educational institutions also use competencies in curriculum development, training and certification. This study therefore presents new evidence on the effectiveness of CBT in providing students with critical competencies so much desired by industry as practised in Tamale Polytechnic.

Using data from the field survey, the findings indicate positive significant effect of CBT on students' acquisition of industry desired competencies as assessed by students, lecturers and industry supervisors. Students' competencies improved significantly in all the 19 industry desired competencies as shown in the data collected before and after their industrial attachment training. Students were found to be competent in two competency areas of knowledge in both theoretical and practical





agriculture before and after the practical training. Lecturers from the polytechnic who supervised students during the practical training also found students to be competent in 18 out of the 19 industry desired competencies that were investigated. Students were found not to be competent in 'critical thinking skills' as assessed by lecturers. However, lecturers did not spend quality time supervising students and to that extent, their assessment of students' competencies may be a less reliable measure of the programme's effectiveness. Equally, industry supervisors assessed students to be largely competent in 15 out of the 19 competencies investigated. They spend quality time with students and their assessment of students competencies could be seen as a more reliable measure of the programme's effect on trainees. They found students not to be competent in critical thinking skills, ability to network in a variety of situations, knowledge of ICT skills needed in the world of work and capacity to deal with changes outside their comfort zones.

Findings from the field survey indicated that all the six assessment components employed in the assessment of students were deemed suitable as assessed by students and lecturers. The practicals component of the assessment were deemed to be the most suitable among all of them with mean of means score of 2.84, while mid-semester recorded the least in terms of its suitability to determine students' competencies with mean of means score of 2.62 as assessed by lecturers and students. It therefore stands to reason that students must have adequate time to practise in order to enable them acquire and demonstrate requisite knowledge and skills. This confirms that practicals are essential in developing skills and the application of theoretical knowledge, create opportunities for team skills training, and



offer a non-threatening environment for unskilled students to reduce their probable mistakes. However, the assessment process is seen to be too labour intensive and time consuming because of its over-reliance on structured observations, check-lists and rating scales. Therefore, assessing learners against pre-defined criteria has the potential of limiting the judgment of assessors on competencies outside the prescribed ones, yet relevant for innovation and subsequent application at the workplace.

The study also sought to obtain from both lecturers and students their preferred grading system for the CBT programme as is being practised in Tamale Polytechnic. From the responses, 74% and 70% of first and second year students are in support of variation in the grading system, while 26% and 30% prefer the status quo. To them, their competencies differ and simply grading them as competent or not yet competent is not fair. They may differ in competencies in terms of speed, accuracy, presentation, problem-solving, among others, and differences in all these should be recognised. The current grading system is not rewarding enough and therefore has the potential of discouraging hard work and stifling initiative. It could disadvantage graduates of the CBT programme in terms of their acceptance for employment and admission into institutions of higher learning. To this end, grading policy decisions should depend on factors such as the motivational effect of higher grades, its effect on learning, the demands of commerce and industry, and the requirements of learning institutions for more information for the purposes of competitive admission and employment. The CBT model should have the capacity to assist students learn beyond work, and stop favouring only the skills needed for work to the detriment of other less instant but potentially significant skills which may



be of use to the learner in the world of work.

On the contrary, an overwhelming 60% of lecturers within the Department are in support of the current grading system. To them, one is either judged competent or not yet competent based on the person's ability to undertake a specified task. They argued it is about the individual's performance against defined standards and not competition among students. They contended that introducing these variations into the grading system would amount to a re-introduction of the rejected norm-referenced grading system which is seen as unsuitable for the development of industry desired competencies.

The study also investigated the contribution of learning facilities to students' acquisition of industry desired competencies where the results showed there were positive significant determinants of training outcomes in 18 out of the 19 dependent variables. Hence, there exist a direct relationship between learning facilities and students' acquisition of purported competencies acquired in Tamale Polytechnic. However, the same cannot be said about the relationship between the learning facilities and students acquisition of 'knowledge of socio-cultural demands in the world of work' since none of the investigated independent variables showed any significant contribution to its acquisition. This therefore implies that its acquisition could be attributed to other variables other than the existing learning facilities in the polytechnic.

Though the impact of the Competency-Based Training programme is impressive in terms of its capacity to assist students acquire much needed industry skills, it suffers from a



number of constraints. The study revealed insufficient places for industrial attachment, inadequate financial support, lack of accommodation for students on industrial attachment, and lack of a well-resourced workshop for the Agricultural Engineering Department as the four top most constraints that bedevil the programme. The findings have implications on the quality of training provided and for the scaling up of the CBT to include all programmes in Polytechnics throughout the country since these constraints have the potential of making it ineffective. Suffice it say that until efforts are made to minimise the impact of these constraints, the programme would not have the capacity to equip students with the desired industry competencies as expected.

The study also sought to ascertain whether there were significant associations between the demographic characteristics of students on CBT and their competencies in Agricultural Engineering as assessed by students. Results from the survey revealed that there is a statistically significant relationship between students 'ages' and their 'problem-solving skills which is a competence required by industry. Besides, the survey also showed that there is a statistically significant relationship between 'profession of parents of students' and their 'ability to transfer skills learnt to practical situations'. It was also found that there were statistically significant relationship between 'ages' of students and the 'educational background of their parents; on one hand, and their 'self-confidence' on the other hand. In the same vein, it was discovered that there is a statistically significant relationship between 'ages' of students and their 'ability to network in a variety of situations'. Furthermore, the study indicated that there is a statistically significant relationship between 'educational background of parents' and students 'theoretical knowledge in agriculture'. The study also



established that there is a statistically significant relationship between ‘occupation of parents’ and students ‘practical knowledge in agriculture’.

The results showed no significant relationship between the selected demographic characteristics of student and industry desired competencies of critical thinking skills, knowledge of socio-cultural demands at work, interpersonal skills relevant at the work place, ability to self-reflect actions, knowledge of ICT skills needed for the work place, awareness of leadership skills needed to lead others, group decision making through dialogue and consensus, organise and express ideas clearly in an outline, ability to know and handle different sides of issues, ability to work methodically, skills to work with people from diverse cultures, and ability to perform different activities at work place. This means could mean that other demographic characteristics other than those studied were responsible for students’ acquisition of these skills.

This study also attempted to establish whether there is significant relationship between the demographic characteristics of lecturers and competencies of students on CBT in Agricultural Engineering as assessed by lecturers. From the survey, it was found that there was a statistically significant relationship between lecturers ‘length of service’ and ‘CBT received’ on one hand, and their ‘problem-solving skills’ on the other hand. Besides, it was also revealed that there was a statistically significant relationship between lecturers’ ‘ages’ and ‘academic qualifications’ on one hand, and their ‘critical thinking skills’ on the other hand. The survey results showed a statistically significant relationship between lecturers ‘length of service’ and students ‘ability to transfer skills learnt to practical situations’.



Again, the study established that there was a statistically significant relationship between lecturers 'ages' and 'academic qualifications' on one hand, and students 'self-confidence' on the other hand. It was also discovered that there was a statistically significant relationship between lecturers 'knowledge in ICT' and students 'ability to network in a variety of situations'.

The study revealed that there was a statistically significant relationship between lecturers 'knowledge in ICT' and students acquisition of 'knowledge in ICT' relevant for the world of work. In addition, the study found that there was a statistically significant relationship between lecturers 'academic qualification' and students acquisition of 'theoretical agricultural knowledge' relevant for the world of work. Finally, it was established that there was a statistically significant relationship between lecturers 'training received in competency based programme' and students acquisition of 'practical agricultural knowledge relevant for the world of work'. However, the results found no any significant relationship between some of the selected demographic characteristics of lecturers and students acquisition of industry desired competencies of Knowledge of socio-economic demands at work, knowledge of interpersonal skills at work place, ability to self-reflect situations, awareness of leadership skills needed to lead others, group decision making through dialogue and consensus, organise ideas clearly in an outline, ability to know and handle different sides of an issue, ability to work methodically, skills to work people from diverse cultures, and being able to handle different activities at work place. The implication is that industry desired competencies could be influenced by other variables aside those that have been investigated in the study.



This research also sought to establish whether there is significant differences in students' competencies as assessed by polytechnic lecturers and industry supervisors. The results showed that apart from the competency item of 'problem-solving skills in the world of work' which indicated no difference for both industry supervisors and polytechnic lecturers, there are differences in all the other variables. Statistically significant differences were found in competencies as assessed by industry and polytechnic supervisors in students' ability to network in a variety of situations, ability to self-reflect actions, knowledge of ICT skills needed for work place, awareness of leadership skills needed to lead others, group decision making through dialogue, organise ideas clearly in an outline, ability to work methodically, capacity to deal with changes outside comfort zone, possesses practical agricultural knowledge and skills to work with people from diverse cultures. The implication of this is that the competency levels as assessed by lecturers and industry supervisors have authenticity problems. Lecturers rarely spend sufficient time with students during industrial attachment, while supervisors at the industry level on daily basis supervise students throughout the three months period of the attachment. The differences in their assessment could be attributed to their different contact times with the students.

## **5.2 Conclusion**

The results of the study corroborates findings of other researchers on the capacity of the Competency-Based Training programmes to equip students with industry desired skills as contained in the literature. As a result of the uniqueness of every organisation, the specifics of their competency frameworks need to be custom fit to support them achieve desired results. Competencies that are considered essential to one organisation



may not attract the same level of relevance to another organisation. Most organisations will be unwilling to share their core competencies with training institutions and their competitors since organisation specific situations and circumstances dictate the tasks that need be accomplished in order to produce the needed outcome. Thus, the CBT at best can only provide generic competencies to trainees and not custom made ones as the programme wants one to believe.

The findings of this research have revealed several important implications for training institutions, industry and policy makers. It is valuable because it has been able to provide useful framework to explain the factors that could enhance the quality of the CBT programme in general and its implementation in training centres and public academic institutions in particular. Accordingly, lecturers and supervisors at the industry level can derive a better understanding of how they could collaborate to make the programme effective. Understanding the factors working against the effectiveness of the CBT programme could assist stakeholders develop an effective approach to changing current practices that inhibit its effectiveness. This study could assist policy makers identify the programmes weaknesses and provide proactive solutions to these problems. The results have also provided the necessary basis for the mobilization and allocation of relevant resources that would ensure effective implementation of the programme. The findings of this study can be used as an important guide for training institutions and industries to develop workable and practical policies for the improvement of the long term quality of CBT.





### 5.3 Contribution to Knowledge

This study has made significant and original contributions to lasting corpus of knowledge at both the academic and practical levels in Ghana as the first explanatory empirical study. The research is the first of its kind in a Ghanaian polytechnic and it has provided in-depth exploration on the effectiveness of the Competency-Based Training programme in providing students with industry desired skills. The reviewed literature as well as the field survey that was conducted revealed the need for more empirical research to establish its capacity to deliver the intended outcomes. The study would contribute to the understanding of gaps that need to be filled in order to make the programme more effective.

Earlier studies on the CBT programme were conducted in jurisdictions whose cultures are markedly different from the Ghanaian context; hence, another major contribution to knowledge. The results of this study have added new dimensions to the CBT concept and coupled with the existing stock of theories, it has increased the knowledge base of the model in training and practice, but in a new context.

The review of the literature in the area of study revealed a methodological deficit because there is over reliance on qualitative approach in most of the previous studies which lacked in-depth empirical investigation. However, this study employed both quantitative and qualitative approaches which made it possible for all aspects of the programme to be considered. Therefore, this study is considered to be the first of its kind to use these approaches and to provide a richer appreciation of the CBT programme in Ghana.



#### 5.4 Recommendations

- The study recommends for lecturers to have industrial training at least once every two years. Equally experienced industry practitioners could be brought into the Polytechnic at least once every semester to enable them to share their experiences with students.
- There is a huge deficit in learning facilities, hence efforts should be made to provide these learning facilities in sufficient numbers to help students acquire these hands-on skills.
- Besides, given the uncertain nature of the job market, the programme should give students the latitude to acquire not only employable, but also portable skills that would assist them fit into other jobs when the need arises.
- This study also recommends that the CBT programme should introduce some level of variation in the grading system that would recognise and reward high achievers.
- To make the CBT model more effective, the polytechnic needs to organise training for industry supervisors to enable them provide the needed supervision.
- Since lecturers may not be able to be with students all the time during industrial attachments, more weight should be placed on the assessment of industry



supervisors in other to make the programme more effective.

- Funds meant for the supervision of students on industrial attachment should be released on time. Money should be given to staff based on distances they travel and not their ranks. Staff who own vehicles should be supported with fuel to travel. Both staff and students should be insured to enable them to have access to most industrial areas.
- The programme could also be made effective if more Master craft men could be identified, encouraged and trained to enable them provide quality hands-on training to the students instead of them relying on few established industries.
- More CBT awareness campaign programmes need to be robustly pursued to assist in sensitising the general public, industry players, employers, and policy makers about it.
- It is also recommended that a forum should be organised for all stakeholders to deliberate on the appropriate mix of financing for the CBT programme since it is expensive to run.
- This study recommends for the resourcing and empowering of the regulatory body NAPTEX which would serve as centre around which all stakeholders would cluster.



### **5.5 Implications for Further Research**

Though this study has provided useful insight into the CBT, it has equally led to some unanswered questions relative to its capacity to provide students with the much needed skills in Ghana. The research therefore represents the beginning of an effort that is geared towards making the programme better. As a result, further studies are required to broaden this research so as to help improve the quality of CBT in Ghana and other jurisdictions. In view of this, the following recommendations are made for future research:

- This study was limited to only Tamale Polytechnic, and it is therefore recommended that future works should have a larger scope that would strengthen the findings of this study in order to ascertain whether generalising these findings is possible beyond where this research was undertaken.
- The researcher also recommends further research to investigate the influence of other factors such as cultural, job related factors of trainees, and other environmental issues that could affect the quality of CBT programme in Ghana.
- Future research could also be carried out to determine the appropriate grading system for the programme.
- Another acknowledged limitation of this study was its over reliance on data obtained from the period the programme started. A repetition of this study in the future would add the benefit of a longitudinal scope and would allow researchers



to understand how the CBT programme could change the competencies of trainees over time.



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**APPENDIX I**

**UNIVERSITY FOR DEVELOPMENT STUDIES**

*Faculty of Agribusiness and Communication Sciences Nyanpkala Campus, Tamale.  
Ghana.*

Dear sir/madam,

**Questionnaire on the Effectiveness of Competency-Based Training on Acquisition of Industry Desired Competencies of Agricultural Engineering Students in Tamale Polytechnic, Ghana**

I am currently a lecturer in Tamale Polytechnic with the Secretaryship and Management Studies Department, undertaking a PhD in Innovation Communication at the University for Development Studies, Ghana. Following the introduction of the Competency-Based Training Programme in that Department for some time now, I would like to seek your opinion on its effectiveness in assisting students' acquire industry desired competencies by completing this questionnaire.

The information obtained will be used along with other respondents in ascertaining the effectiveness of the programme. Your cooperation and objective responses will greatly contribute to providing an empirical basis for improving Competency-Based Training in Agricultural Engineering that will ultimately impact positively on lecturers and students' lecturing and learning in all training institutions in Ghana and beyond. I will therefore appreciate your honest opinion while at the same time assuring you that the information provided will be treated with confidentiality.

Kindly return the completed questionnaire to the undersigned as soon as possible and thank you for your anticipated co-operation.

Yours faithfully,

Signed

Aboko Akudugu.

**Tel: 0249077918**





**APPENDIX 1A**  
**QUESTIONNAIRE FOR STUDENTS IN AGRICULTURAL ENGINEERING**  
**DEPARTMENT (YEAR ONE AND TWO)**

**SECTION A: DEMOGRAPHIC DATA OF STUDENTS**

For each item, please **TICK (√)** the option that corresponds to your choice.

1. Sex:
  - Female
  - Male
  
2. Age:
  - 20 – 24years
  - 25 – 29years
  - 30 – 34years
  - 35 – 39years
  - > 39 years
  
3. Profession of parents:
  - Farmer,
  - trader,
  - salary earner,
  - contractor,
  - others
  
4. Educational background of parents:
  - Tertiary,
  - senior high
  - basic level,
  - no education,
  - others
  
5. Which of these grading systems would you prefer for the CBT programme?
  - 50-100, Competent and <50, Not yet competent
  - 80-100, Very Competent; 60-79, Competent; 40-59, Fairly Competent; and <40, Not Competent.
  - 80-100, Distinction; 60-79, Credit; 50-59, Pass; and <50, fail.
  - 75-100, First Class; 70-74, Second Class Upper; 60-69, Second Class Lower; 50-59, Pass; and <50, Fail.

**SECTION B: INDUSTRY DESIRED COMPETENCIES**

6. Please rate yourself on the following statements as; 4- very competent 3- competent, and 2 – not yet competent, 1– very not yet competent

Item	Desired Competencies of students	1	2	3	4
6.1	Problem-solving skills in the world of work				



6.2	Critical thinking skills				
6.3	Knowledge of socio-cultural demands at work place				
6.4	Ability to transfer skills learnt to practical situations				
6.5	Knowledge of interpersonal skills at work place				
6.6	Self-confidence				
6.7	Ability to network in a variety of situations				
6.8	Ability to self-reflect actions				
6.9	Knowledge of ICT skills needed for work place				
6.10	Awareness of leadership skills needed to lead others				
6.11	Group decision-making through dialogue and consensus.				
6.12	Organize/express ideas clearly in an outline/a draft form.				
6.13	Ability to know and handle different sides to an issue				
6.14	Ability to work methodically				
6.15	Capacity to deal with changes outside comfort zones.				
6.16	Possesses theoretical agricultural knowledge				
6.17	Possesses practical agricultural knowledge				
6.18	Skills to work with people from diverse cultures.				
6.19	Being able to handle different activities at work place				

### SECTION C: LEARNING FACILITIES

7. Please rate by ticking (√) in the appropriate column the level of adequacy of the following facilities in the training students on the CBT programme as; 4 - very adequate, 3- adequate, 2 – fairly adequate, and 1- inadequate

No.	Learning facilities	1	2	3	4
7.1	Appropriate ICT centre for training				
7.2	Availability of Farmlands for practicals				
7.3	Relevant and adequate machines for practicals				
7.4	Simulation centres for demonstrations				
7.5	Library with relevant and sufficient learning materials				
7.6	Appropriate workshops for practicals				

### SECTION D: CBT ASSESSMENT SYSTEM

8. Please indicate by ticking (√) in the appropriate column the suitability level of the various components of students assessment as; 4- very suitable, 3- suitable, 2 – fairly suitable, and 1 – unsuitable

No.	Components of assessment	1	2	3	4
8.1	Mid semesters				
8.2	Presentations				
8.3	Practicals				
8.4	Class tests				
8.5	End of semesters				
8.6	Assignments				



**APPENDIX 1B**  
**QUESTIONNAIRE FOR LECTURERS IN AGRICULTURAL ENGINEERING**  
**DEPARTMENT**

**SECTION A: DEMOGRAPHIC DATA OF LECTURERS**

**INSTRUCTIONS:** For each item, please **TICK (√)** the **option** that corresponds to your choice.

1. Sex:  
 Female  
 Male
2. Age:  
 21 – 30years,  
 31 – 40years,  
 41 – 50years,  
 51 – 60years  
 > 60years
3. Academic qualification:  
 PhD,  
 Master’s degree,  
 Bachelor degree  
 Diploma  
 Others
4. Length of service:  
 1 -5years,  
 6 – 10years,  
 11 – 15years,  
 16 – 20years,  
 > 20years
5. Current job title:  
 Senior lecturer  
 Lecturer  
 Principal instructor  
 Senior instructor  
 Instructor
6. Current responsibility:  
 Head of Department  
 Course coordinator  
 Sectional head  
 No responsibility  
 Others; Specify.....



7. Training received in CBT
- Very adequate
  - Adequate
  - Fairly adequate
  - Inadequate
  - None
8. Knowledge in ICT
- Very effective
  - Effective
  - Fairly effective
  - Ineffective
  - None
9. Which of these grading systems would you prefer for the CBT programme?
- 50-100, Competent and <50, Not yet competent
  - 80-100, Very Competent; 60-79, Competent; 40-59, Fairly Competent; and <40, Not yet competent.
  - 80-100, Distinction; 60-79, Credit; 50-59, Pass; and <50, fail.
  - 75-100, First Class; 70-74, Second Class Upper; 60-69, Second Class Lower; 50-59, Pass; and <50, Fail

**SECTION B: INDUSTRY DESIRED COMPETENCIES**

10. Please rate by ticking (√) in the appropriate column the student on the following competencies as; 4 - very competent 3- competent, 2 – fairly competent, 1– not yet competent.

Item	Desired Competencies of students	1	2	3	4
10.1	Problem-solving skills in the world of work				
10.2	Critical thinking skills				
10.3	Knowledge of socio-cultural demands at work place				
10.4	Ability to transfer skills learnt to practical situations				
10.5	Knowledge of interpersonal skills at work place				
10.6	Self-confidence				
10.7	Ability to network in a variety of situations				
10.8	Ability to self-reflect actions				
10.9	Knowledge of ICT skills needed for work place				
19.10	Awareness of leadership skills needed to lead others				
10.11	Group decision-making through dialogue and consensus.				
10.12	Organize/express ideas clearly in an outline/a draft form.				
10.13	Ability to know and handle different sides to an issue				
10.14	Ability to work methodically				
10.15	Capacity to deal with changes outside comfort zones.				
10.16	Possesses theoretical agricultural knowledge				



10.17	Possesses practical agricultural knowledge				
10.18	Skills to work with people from diverse cultures.				
10.19	Being able to handle different activities at work place				

### SECTION C: LOGISTICAL CONSTRAINTS

11. Please indicate by ticking (√) in the appropriate column your level of agreement with respect to Logistical constraints of CBT assessed as; 5 - strongly agree, 4 – agree, 3– neutral, 2 - disagree and 1 - strongly disagree

Item	Logistical constraints	1	2	3	4	5
11.1	Inadequate learning modules					
11.2	Limited number of computers					
11.3	Insufficient number of machines for practicals					
11.4	Limited number of Workshops for hands-on training					
11.5	Inadequate budget for industrial attachment supervision					
11.6	Difficulty finding places for attachment					
11.7	Tasks given at workplace are unrelated to study					
11.8	Lack of accommodation for Students on attachment					
11.9	Limited time for mentoring students					
11.10	Inappropriate grading system for the programme					
11.11	Unwillingness on the part industry to accept students					
11.12	Lack of effective transportation system for supervision					
11.13	Untimely release of funds for supervision					
11.14	Limited practicals for fear of students					
11.15	Inadequate skilled staff to teach and supervise students					

### SECTION D: LEARNING FACILITIES

12. Please rate by ticking (√) in the appropriate column the level of effectiveness of the following facilities in the training of students on the CBT programme as; 4 - very adequate, 3 - adequate, 2 – fairly adequate and 1 - inadequate

No.	Learning facilities	1	2	3	4
12.1	Appropriate ICT centre for training				
12.2	Availability of Farmlands for practicals				
12.3	Relevant and adequate machines for practicals				
12.4	Simulation centres for demonstrations				
12.5	Library with relevant and sufficient learning materials				
12.6	Appropriate workshops for practicals				

### SECTION E: COMPONENTS OF ASSESSMENT

13. Please indicate by ticking (√) in the appropriate column the suitability of the various components of students assessment as; 4- very suitable, 3 - suitable, 2 – fairly suitable, and 1 - unsuitable

No.	Components of assessment	1	2	3	4
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13.1	Mid semesters				
13.2	Presentations				
13.3	Practicals				
13.4	Class tests				
13.5	End of semesters				
13.6	Assignments				





**APPENDIX 1C**  
**QUESTIONNAIRE FOR INDUSTRY SUPERVISORS**  
**SECTION A: DEMOGRAPHIC DATA OF INDUSTRY SUPERVISORS**  
**INSTRUCTIONS:** For each item, please **TICK (✓)** the option that corresponds to your choice.

1. Sex
  - Male
  - Female
  
2. Age:
  - 21 – 30years,
  - 31 – 40years,
  - 41 – 50years,
  - 51 – 60years
  - > 60years
  
3. Type of industry
  - Manufacturing
  - Agricultural
  - Government sector
  - Construction
  - Others; Specify.....
  
4. Current job title:
  - Managing Director
  - Director
  - Manager
  - Supervisor
  - Others; Specify.....
  
5. Work experience
  - < 3 years
  - 3 - 5 years
  - 6 - 10 years
  - 11-14 years
  - > 14
  
6. Highest academic qualification
  - Basic certificate
  - Senior High school certificate
  - Diploma
  - Bachelor degree
  - Master degree

Others; Specify.....

7. Number of employees:

- < 5
- 5 -10
- 11 -15
- 16 – 20
- > 20

**SECTION B: DESIRED COMPETENCIES OF STUDENTS**

8. Please rate by ticking (√) in the appropriate column the student on the following competencies as; 4 - very competent, 3- competent, 2 – fairly competent, 1 – not yet competent.

Item	Competencies required of students	1	2	3	4
8.1	Problem-solving skills in the world of work				
8.2	Critical thinking skills				
8.3	Knowledge of socio-cultural demands at work place				
8.4	Ability to transfer skills learnt to practical situations				
8.5	Knowledge of interpersonal skills at work place				
8.6	Self-confidence				
8.7	Ability to network in a variety of situations				
8.8	Ability to self-reflect actions				
8.9	Knowledge of ICT skills needed for work place				
8.10	Awareness of leadership skills needed to lead others				
8.11	Group decision-making through dialogue and consensus.				
8.12	Organize/express ideas clearly in an outline/a draft form.				
8.13	Ability to know and handle different sides to an issue				
8.14	Ability to work methodically				
8.15	Capacity to deal with changes outside comfort zones.				
8.16	Possesses theoretical agricultural knowledge				
8.17	Possesses practical agricultural knowledge				
8.18	Skills to work with people from diverse cultures.				
8.19	Being able to handle different activities at work place				





## APPENDIX 2

### UNIVERSITY FOR DEVELOPMENT STUDIES

*Faculty of Agribusiness and Communication Sciences Nyanpkala Campus, Tamale.*

Dear sir/madam,

#### **Request to be interviewed on the Effectiveness of Competency-Based Training on Acquisition of Industry Desired Competencies of Agricultural Engineering Students in Tamale Polytechnic, Ghana**

I am currently a lecturer in Tamale Polytechnic with the Secretaryship and Management Studies Department, undertaking a PhD in Innovation Communication at the University for Development Studies, Ghana. Following the introduction of the Competency-Based Training Programme in your Department for some time now, I would like to seek your opinion on its effectiveness in assisting students' acquire industry desired competencies by obtaining your responses from the questions that would be asked.

I intend to conduct a number of semi-structured interviews lasting about 30 minutes with a variety of people within the Polytechnic and other key industry players to ascertain their perspectives on this subject matter. I would be exceedingly grateful if you would be willing to be interviewed, perhaps I could contact you shortly to arrange a place and time that would be convenient for you. I will therefore appreciate your honest opinion while at the same time assuring you that the information provided will be treated with confidentiality. If you require any further information regarding this research, please do not hesitate to contact me, and thank you for considering this request.

Yours Faithfully,  
Signed  
Aboko Akudugu

#### **INTERVIEW GUIDE FOR PARTICIPANTS**

Introduction	Question	Prompts
	How effect is CBT in providing students with industry desired competencies?	
	Will the involvement of industry in the CBT assist trainees acquire the needed competencies?	
	Do you have a healthy collaboration with industry/polytechnic?	
	In your opinion, do you think the facilities available are adequate for the CBT?	
	In your view, is the mode of assessment for the CBT suitable?	
	Do you think the grading system for the CBT be varied or maintained?	
	What do you think in your experience are the constraints of the CBT programme?	
	Suggestions to make the programme more effective?	



**APPENDIX 3**

**UNIVERSITY FOR DEVELOPMENT STUDIES**

*Faculty of Agribusiness and Communication Sciences Nyanpkala Campus, Tamale.  
Ghana.*

Dear sir/madam,

**Request to observe the Effectiveness of Competency-Based Training on the  
Acquisition of Industry Desired Competencies of Agricultural Engineering Students  
in Tamale Polytechnic, Ghana**

I am currently a lecturer in Tamale Polytechnic with the Secretaryship and Management Studies Department, undertaking a PhD in Innovation Communication at the University for Development Studies, Ghana. Following the introduction of the Competency-Based Training Programme in your Department for some time now, I would like to seek your permission to observe the adequacy of learning facilities, mode of delivery and possible constraints to the programme.

I intend to undertake a number of observations that may last about 45 minutes during practicals sessions, learning facilities and lectures within the Polytechnic. I would be exceedingly grateful if you would be willing to allow me access to these places. I would contact you shortly to arrange a time that would be convenient for you. Confidentiality will be completely respected. Thank you for considering my request.

Yours Faithfully,  
Signed  
Aboko Akudugu

**OBSERVATION SCHEDULE WITHIN POLYTECHNIC AND INDUSTRY**

DATE	COMPETENCIES	LOCATION	TIME
	Tractor servicing	Workshop	
	Lectures	Lecture Hall	
	Presentations	Lecture Hall	
	Tilling of land	Farmland	
	Harvesting	SARI, Tamale	
	Machines maintenance	MOFA, Tamale	

