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Relevance of Competency Based Training in Polytechnic Education for National Development

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Abstract

The educational system in Ghana has undergone various forms of transformation over the last few decades. These transformations aim at improving the educational system to produce the right calibre of graduates for national development. The Ministry of Education in 1987 introduced new educational system which gradually replaced the British-based G.C.E Ordinary and Advanced level systems. In September 2007, the country gave birth to another educational reform which emphasized on Science, Mathematics, Technology and Technical & Vocational Educational Training (TVET). This is to provide employable skills for graduates and help reduce the high rate of unemployment in the country. Over the years, TVET has been limited to the apprenticeship, vocational and technical institutions. Learning at the tertiary level has always been the acquisition of theoretical knowledge with very little hands on training. Industries have no other alternative than to give their employees many weeks of "on the job training". Introduction of Competency Based Training (CBT) at the polytechnics which aims at providing graduates with the employable skills is therefore welcoming news and must be cherished and sustained by all. CBT is the acquisition of appropriate knowledge, attitudes, personal traits and skills to efficiently perform work place roles in industry, commerce, management and administration. This paper highlights further the need for CBT in all the Ghanaian polytechnics. It outlines the importance of CBT in polytechnic education, gives overview of the structure of the CBT curriculum, its development and implementation in agricultural engineering, assessment criteria and challenges. It was concluded with some recommendations.

1.0 Introduction

The growing need of Technical and Vocational Educational Training for national development has brought series of educational reforms over the last few decades. In 1987 the Ministry of Education introduced a new educational system which gradually replaced the British-based 'O' and 'A' level system. After 20 years of it existence, it has become necessary to introduce another reforms which could address pertinent national and international challenges. The current reform which was introduced in September 2007 focuses on the role of science, mathematics, technology, technical and vocational training and ICT. The goal is to impart graduates with essential skills needed for personal growth, community development and exploitation of economic opportunities.

The herald of Competency Based Training into the Polytechnic educational system will provide the necessary skills and competencies in graduates for sustainable development (Gasper, 2005). The polytechnics have been mandated to train graduates for industry, commerce, business and administration. This is indeed a challenge to our educational system. CBT actually suggest the 3Rs of learning: learn what is *relevant*; learn far more *rapidly*; and learn for *redistribution.* This statement emphasizes on the acquisition of basic skills and knowledge to produce the desired outcome. Competency Based Training has been found to be an appropriate training instrument for industry and business (Delker, 1990).

1.1 Definitions

Competency: A competency is a combination of knowledge, skills, personality traits and attitude for proper functioning of a professional situation.

Skill: A task or group of tasks performed to a specific level of competency or proficiency through the use of instrument, equipment, etc.

Competency Based Training is therefore a way of approaching (vocational) training that places primary emphasis on what a person can do as a result of training (the product), and as such represents a shift away from the emphasis on the process involved in training (the inputs). It is concerned with training to industry specific standards rather than an individual's achievement relative to others in the group (Wolny, 1999).

i.e CBT=DIY = Do It Yourself = Knowledge + Skills + Attitudes + Personality Traits

1.2 Practical example of a competency

A doctor must be able to persuade an overwrought and headstrong patient to rest fully and take the proper medicine. How can he manage such the situation? He needs the following:

Knowledge: must be able to identify or diagnose the symptoms leading to overwrought (e.g. stress and sleeplessness) and also prescribe the right medicine for the patient.
Skills: must be able to handle basic equipment such as stethoscope and communicate effectively. For instance, he must be able to communicate unpleasant news to the family of a patient in a reassuring way to make them accept the news with ease.
Personality traits: everybody has an innate characteristics / traits which might be essential to the profession. The doctor needs patience, exactitude, honesty and other characteristics to enable him persuade and convince his patients that he is a good doctor.
Attitudes: every profession has standards, ethics and values. The doctor must work within these principles and exhibit the right attitudes towards the profession.
Also a mechanical engineer must acquire all the above competencies in addressing a problem in somebody's vehicle. He must be able to diagnose a fault in an engine and fix that fault without difficulty (Grit *et al.* 2006)

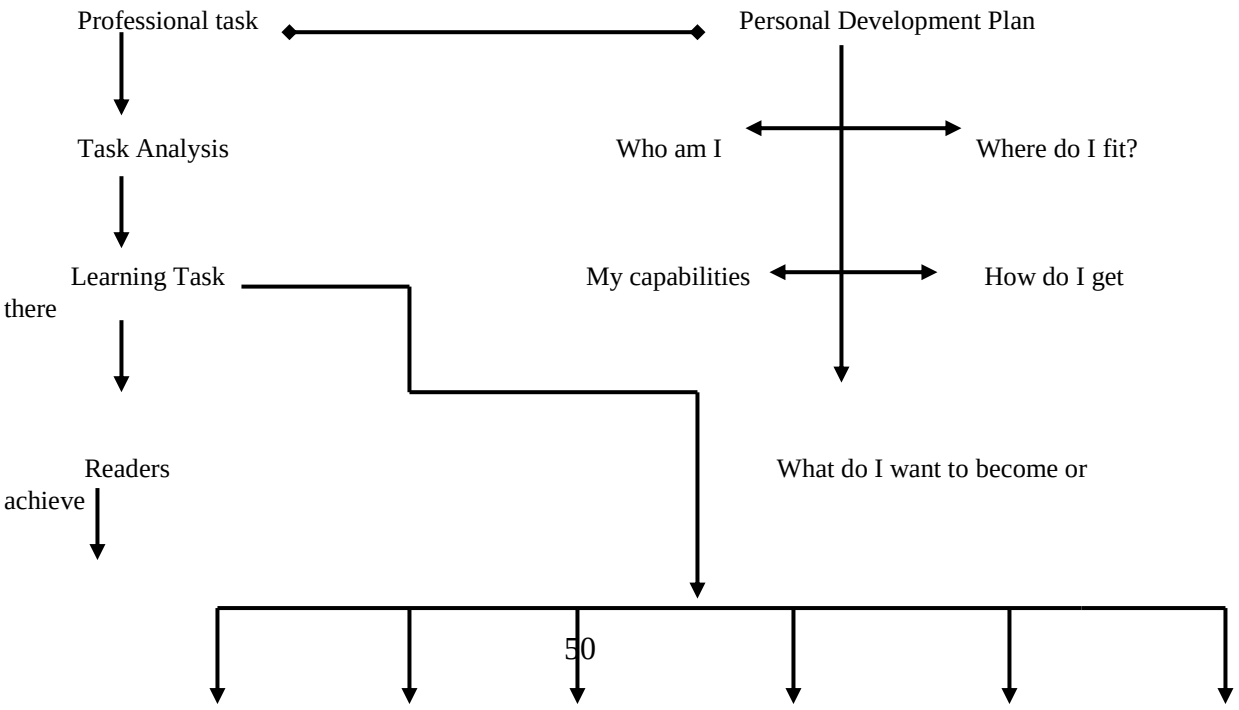
1.3 Principles of Competency Based Training

Student Centred
The student is the active player. The student generates the learning goals and is responsible for his or her own learning activities in terms of time and rate. The lecturer as a coach guides the student to develop these competencies.

Task Based
Learning activities are directed towards performing the professional task. This ensures active learning instead of passive learning.
Competence Oriented
Learning tasks are formulated to develop competencies that are needed to perform the professional tasks of the student's future working environment.

1.4 Development of CBT curriculum of Agricultural Engineering

The development of Competency Based Training curriculum is quite strenuous and very expensive. Below is a flow chart which explains the development of CBT.



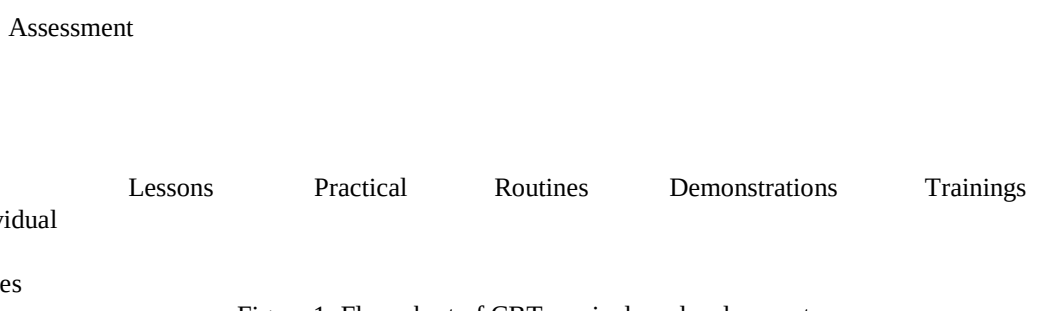


Figure 1: Flow chart of CBT curriculum development

Professional Task: the Professional task was developed using the results of job market survey undertaken by staff of the Agricultural Engineering Department of Bolgatanga, Ho, Tamale and Wa Polytechnics. The staff was divided into 7 groups of 3 participants each. They visited various industries, irrigation schemes, organizations and civil services in Tema, Ho and the surrounding communities to find out the roles of agricultural engineers. The results were grouped and similar jobs were combined and others were critically analysed. The professional tasks were then formulated from the outcome of the job market surveyed.

Learning task: the learning tasks were generated from the Professional tasks after a critical task analysis had been carried out. The learning tasks were all geared towards the realization of the professional assignment. Lesson plans (lectures), practical lessons, demonstrations and routines were prepared for the students to enhance their acquisition of theoretical knowledge and practical skills. Time is also allocated for their individual studies. The learning task is concrete, authentic and whole task experience. They are organized in a simple to complex sequence of task classes. This implies that the learning tasks increase in difficulty as the student progresses. It also enjoys high level of support at the initial stages and the support disappears at the end of the task class. This process is referred to as scaffolding (Merrienboer *et al*. 2002)

Readers: readers are reference materials prepared for the students to facilitate their learning processes. They contain all relevant information required to accomplish the professional task. Assessment for the students are then prepared including industrial attachment.

Personal development plan is also prepared for the students and run concurrently with the professional task. This is all about students' goals, ambitions, and aims and how to realize them in relation to the professional task and future career. Students are guided to develop their work on their development plan by asking certain questions about their personality. This is to help shape their attitudes and personal traits. They ask questions such as:

- Who am l?
- What are my capabilities?
- What do I want to become / achieve?
- Where do I fit?
- How do I get there?

Students will continue to manage and review their personal development plans until they complete their programme of study.

The curriculum is made up of Teaching Guide, Learning Guide and Readers

Teaching Guide: contains all the materials and information needed by the lecturer (coach) to facilitate the learning process of the students.

Learning Guide: this is an extract from the teaching guide: it contains all materials and information required by the student to perform the professional task.

2.0 Structure of Competency Based Training Curriculum

The sample formats of the curriculum which are presented at the end of the text were designed by the Lecturers of Agricultural Engineering of the four Polytechnics. Format for Demonstrations and Routines are similar to the practical format.

3.0 Assessment in Competency Based Training

Students are assessed on knowledge, skills and attitudes but emphasis is on the acquisition of skills. Assessment involves both internal and external assessors. During the assessment, a person from the industry or any other organization with an in depth knowledge in the topic is invited to take part in the assessment. Examinations are conducted to test students knowledge acquisition but do not form the basis for progression. Assignments are based on the formulation of real life situation and the use of simulations. A combination of ORCER (Observe, Record, Classify, Evaluate and Report) and LSD (Listening, Summarizing and Deepening) methods are also used during the assessment of students in practical examinations sessions.

List of generic competencies and their descriptions are presented at the end of the text.

3.1 Rubrics

To avoid the temptation of awarding marks based on the lecturer's opinion and judgment, Rubric is used in assessing the students as well as the assessment criteria. Rubric is a set of criteria and standards linked to the learning objectives. It makes grading simpler and more transparent. Sample of the assessment form is presented at the end of the text.

3.2 Industrial Attachment

Industrial attachment forms an important component of CBT curriculum. It forms 16 credit hours of the total credit hours. Various job profiles have been identified where students are expected to have their attachment and possible placement after graduation. It is designed to help students to learn and familiarize themselves with real life situation at the industries. It also helps students to network and make contacts so as to get job easily after graduation. It also guides students to make appropriate choices in terms of career development.

Sample industrial attachment assessment form is presented at the end of the text.

4.0 Uniqueness of CBT in Polytechnic Education

While the new educational reform emphasises on science, mathematics and technology as well as technical and vocational education and training to position the country for accelerated development, polytechnics are to structure all their programmes to conform to the principles of CBT. Polytechnics unlike the universities are mandated to provide tertiary education in the field of manufacturing, commerce, science, technology, applied science and arts. The polytechnics therefore have a herculean task of training graduates to fill the middle level man power needed for industry, commerce, business and administration. Competency Based Training however, seeks to address the above challenges through the principle of "do it yourself". Nonetheless, CBT course should be learnt in an environment that duplicates or simulates the work place (Norton, 1987).

Unlike the traditional method of teaching which results only in passive learning, CBT ensures that students engage in active learning because the unit of progression is mastery of specific knowledge and skills. The traditional system is associated with information or memory overload, inadequate time for real learning process but rather memorization, lecturer directed and time bound. Having said that the traditional system also has some advantages such as large students' enrolment, large amount of information delivered per lecture and the lecturer having command over the learning process.

Among the things which make CBT more relevant to polytechnic education are:

- The student requires less training on the job and acquires working experience more rapidly
- Industrial attachment forms a major component of the programme thus graduates fit more easily into the job market after graduation.
- The students develop their own learning goals and time frame and learning experiences are oriented by continuous feedback.
- The student develops competencies and skills relevant for the job market
- Learning is flexible but challenging, and does not require traditional examinations to determine the progress of the students.
- Learning guide, practical manuals and readers (reference materials) are made available to students.

- CBL does not require detailed study of subjects that are irrelevant to the performance of the Professional tasks.
- It makes teachers prepare thoroughly and in advance and respect the choice of the students.
- The curriculum is flexible in terms of study time per student. This means that students progress at their own pace and not at the pace of the teacher.

4.1 Challenges

Competency based training is very expensive and comes with its own challenges both in curriculum development and implementation (Agodzo & Songsore, 2005). Besides, the following are likely to impede the successful implementation of CBT programmes. They challenges outlined and many others are therefore to be considered seriously before new CBT programmes are introduced by all polytechnics. The National Accreditation Board (NAB), National Commission for Tertiary Education (NCTE) and National Board for Professional and Technical Examination (NABPTEX) should therefore work together to address some of the pertinent challenges before converting all the polytechnic programmes into CBT.

- Commitment of polytechnics to provide adequate resources, training materials and consumables for CBT.
- Too much work load on lecturers thus they work beyond the recommended teaching load.
- Conflict of CBT time tabling and the traditional time table
- Difficulty in getting industrial attachment places for CBT students
- Lack of adequate equipment for CBT programs
- Cost of readers put too much financial stress on CBT students

5.0 Conclusion and Recommendations

5.1 Conclusion

The competency based training emphasizes on the product students demonstrate after their training period and focuses on practical training in ensuring that students acquire the necessary competencies and skills. It begins with a clear identification of competencies and skills students need to master and state clearly the criteria and conditions by which performance are assessed which are made available to the students in advance (Norton, 1987)

Competency based system may be new to most of the polytechnics but the concept and approach have been accepted worldwide in industries and many training organizations. Industrialists, scholars and opinion leaders are all emphasizing on technical and vocational training thus the polytechnics are challenged to come out with new modalities and teaching methodologies that address the training needs of the nation.
Competency Based Training has therefore come at an appropriate time to ensure that graduates acquire the necessary knowledge, skills, attitudes and personal traits to efficiently perform professional roles. This is in line with the old Chinese proverb: "I hear and I forget; I see and I remember; I do and I understand."

5.2 Recommendations

To ensure the success and sustainability of CBT, the following are recommended:

- There should be enough funding necessary for CBT training and purchase of equipment.
- Stronger links and collaboration with industry and private sector for industrial attachment.
- Commitment and support from all stakeholders in polytechnic education is necessary for sustainability of CBT.
- Trainers/lecturers should be motivated so as not to slip back to the traditional system of teaching.
- Training materials and consumables should be made available.

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Appendix

Structure of Competency Based Training Curriculum

Professional Task format: Course AE 141: Irrigation Water Management

Short Description	
Time	
LT 1	
LT 2	
LT 3	
LT 4	
LT 5	
LT 6	
L.SOURCES	
Supportive information	
Total Materials	
General Competencies trained	
Assessment	

Learning Task Format: LT 131.1: Estimating the water requirement of the crop

Short Description						
Supportive Info						
JIT-info						
Level of Support						
Materials						
Ex	Steps					
	Activities					
Supporting learning activities	Attend Lecture					
	Individual Study					
	Group Work					
	Attend Demo					
	Do Practical					
	Acquire skills-routine					
	Participate in workshop					
	Train Competency					
	Hrs Total					

Lesson Plan Format: L 1.1 Introduction to water management in irrigation

Subject			
Specific Objectives			
Time 120min	**Phase**		**Resources Remarks**
20 min	Orientation		
50 min	Exploration		
30 min	Evaluation		

20 min	Transfer		

Field Practical Format: P 141.1 Taking Field Data on the Soil

Student instruction	
Practical subject	
Time	
Learning objectives	
Context	
Description of assignment	
Instruction	
Reflection	
Lecturer instruction	
Organization	
Activities of lecturer	

NUFFIC Workshop, 2007

Format of Competency Assessment

Assessment form task AE131	**score**			
Assessment criteria	**Fail**	**Pass**	**Good**	**Excellent**
Has the student: 1. PLAN AND ORGANISE Students organize work in an appropriate sequence 1. Clear statement of the objective. {level 2 No 1} 2. Written presentation of sequential arrangement of things to be done. {level 2 No 2} 3. Good time plan with respect to the sequence of things to be done. {level 2 No 3 4. Adequate organizational skills. {level 2 No 4} 2. TO GATHER INFORMATION On appropriate materials, tools, and methods. 1. Has the student been using the right tools\equipment in getting the information? {level 2 No 1} 2. Has the student been using the right approach? {level 2 No 2} 3. Is the information gathered relevant to the PT? {level 2 No 3} 4. Has sufficient information been gathered? {level 2 No 4}				
Total Grade				

Rubrics for competencies

Competency	Level 1	Level 2	Level 3	Level 4

INDUSTRIAL ATTACHMENT ASSESMENT FORM

Please complete this confidential assessment form and give it to the student in a sealed envelope. Kindly sign across the envelope before giving to the student.								
NAME OF STUDENT								
INDEX NUMBER / YEAR OF STUDENT								**HND**
PROGRAMME/COURSE								
NAME & ADDRESS OF ORGANIZATION (name, addr, tel, mail)								
DEPARTMENT ASSIGNED								
DURATION OF ATTACHMENT								
	COMPETENCIES	0 = Void 1 = Weak 2 = Minimum 3 = Average 4 = Good 5 = Outstanding						
		0	**1**	**2**	**3**	**4**	**5**	**COMMENTS**
	SPECIFIC TASKS							
1		0	1	2	3	4	5	
2		0	1	2	3	4	5	
3		0	1	2	3	4	5	
4		0	1	2	3	4	5	
	GENERAL EMPLOYMENT SKILLS							
1	Ability to complete work on schedule	0	1	2	3	4	5	
2	Ability to follow instructions carefully	0	1	2	3	4	5	
3	Ability to take initiative	0	1	2	3	4	5	
4	Ability to work with a little bit of supervision	0	1	2	3	4	5	
5	Ability to work with other staff	0	1	2	3	4	5	
6	Adherence to organization’s rules & regulations	0	1	2	3	4	5	
7	Adherence to safety and environmental rules	0	1	2	3	4	5	
8	Resourcefulness	0	1	2	3	4	5	
	ATTITUDE TO WORK							
1	Attendance to work	0	1	2	3	4	5	
2	Punctuality	0	1	2	3	4	5	
3	Desire to work	0	1	2	3	4	5	
4	Willingness to accept new ideas and suggestions	0	1	2	3	4	5	
	HUMAN RELATIONS							
1	Relationship with subordinates	0	1	2	3	4	5	

2	Relationship with colleagues	0	1	2	3	4	5	
3	Relationship with superiors	0	1	2	3	4	5	
4	Ability to control emotions when provoked	0	1	2	3	4	5	
Additional Comments								
	Total score							Name of Supervisor: ……
	General remarks							
(TO BE COMPLETED BY HEAD OF DEPARTMENT)								Signature and Stamp ……..
Number of credit hours								
Recommended score / grade								Place: Date:
Signature:	Date:							……., …….

Source: CBL – NUFFIC Workshop, 2007

List of generic competencies and their descriptions

.Generic Competencies	Description
To Observe	Observe and identify with respect to the task the signal, problems, trends, needs and opportunities in the performance of a whole job.
To Reflect	Describe properly own behaviour and performance and make an analysis to detect points for change or improvement.
To Train	Provide a participatory training using different teaching methods.
To Coach	Coach and guide workers and learners.
To Record/Report	Prepare a report, arranging the topics / chapters oriented on specific target groups of readers.
To Work methodically	Work in a methodical way using appropriate tools at the right moment, using adequate procedures.
To Gather information	Gather information relevant for optimization of the analysis.
To Plan/Organize	Derive a plan from the objectives to be achieved and plan / organize the work within the standard schedule for execution.
To Implement/Execute	Implement by following strictly the supplied instructions.
To make Oral presentation	Give an understandable presentation in very clear, orderly, logical well structured way.
To Optimize	Optimize the performance of people, materials and other inputs by following instructions.
To Assess	Assess the analysis following the standard instruction and map out standard strategies to provide solutions.
To cooperate	Ability to work with others (peers, known people) without difficulties in the group. A requirement for associates with people, group work, listening ability, devotion and confidence in people.
To Control	Control the quality and quantity of the materials and product, by comparing at recommended acceptable standard.
To Analyse	Analyze the gathered information, by comparing the standard instruction and information.

Source: Afeti et al. Proposal for a new CBL curriculum in Agric. Eng., 2006.