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# IMPROVING THE USE OF COMPETENCE-BASED TRAINING (CBT) IN POLYTECHNIC EDUCATION IN GHANA: AN EVALUATION OF THE CIVIL ENGINEERING DEPARTMENT OF TAKORADI POLYTECHNIC

By

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*ABSTRACT*

*Quality Polytechnic education and training is expected to equip students with consistent, high quality training and education that can be delivered and recognized across territorial boundaries. Currently, the ongoing restructuring of the labour markets and significant changes in occupational structures and skill requirements have strongly challenged the quality and performance of vocational education in Ghana. Further, substantial concern is being raised about how Polytechnic education can influence employment and the school to work transition. This research explores these new changes and demands.*

*A major objective of the study was to investigate how the department could improve the effectiveness of the already existing mechanisms for CBT at Takoradi Polytechnic and maximize the effectiveness of Polytechnic-industry collaborations. There were in total 181 respondents; from the industries and Takoradi Polytechnic. Three different sets of questionnaires and an interview guide were used to collect data the respondents. Descriptive statistics were used to present the data after which evaluation criteria were used to make value judgment about the quality of the polytechnic education. The study showed*

*that the level of practical training is not satisfactory , and there is a limited relationship between the polytechnic and the industry. Hence there is the need to: redesign the curriculum giving more attention to practical training; improve the practical knowledge of the staff; make real life research a core activity of the department; and develop other better ways of connecting the polytechnic with the industries other than students' attachment using the CBT approach..*

## Introduction

The purpose of this research was to systematically assess, evaluate and improve the quality of the already existing mechanisms for competency based education at Takoradi Polytechnic. The study also intended to investigate how an effective polytechnic-industry collaboration can be built and sustained in Ghana. This is necessary because school self evaluation provides information to

decision makers for judging decision alternatives (Stufflebeam et al., 1971). Acknowledging the importance of school self evaluation, it was worthwhile to assess and evaluate the performance of the competency based training (CBT) approach used by the Civil Engineering Department at Takoradi Polytechnic in order to improve the quality of polytechnic education in Ghana.

## Background to the Study

Existing literature is enriched with materials on competency based education and training and school-industry relationships. CBT seeks to match educational training with employer and employee needs (Field & Drysdale, 1991). It promotes high-quality academic and career preparation and bridges the gap between what is learned at school and what is required in the workplace (Hoerner & Wehrley, 1995). Competency-based training have the following characteristics: knowledge is developed in more diverse contexts; knowledge production is investigator-initiated, discipline-based, problem-focused and interdisciplinary. CBT is informed by the view that global economic and technological changes require workers to exhibit a broader range of skills at work, specifically, flexible and adaptable skills. Hence, CBT requires the development of broad, generic, skills and a close link between academic learning and professional practice. It attempts to move vocational and technical education to a point where qualifications can be gained through assessment of competency standards, instead of a course of study or consistency in curricula. Some key characteristics include specified training and assessment outcomes; industrial involvement in defining outcomes; competency standards or, more commonly, competencies, as the expression of these outcomes; and the training programmes are based on industrial competency standards. Unlike competency based education which explores 'new ways; competency-based training focuses on competencies in specific practices, practices that reside within current circumstances and conditions (Wenger, 1998,)

According to Nsiah Gyabaah (2005), Polytechnics in Ghana have witnessed significant increases in students' enrolments, however the government's budget for the

educational sector decreased by minus 11.3% in the tertiary sub-sector between 1991/1992 and 1999/2000 academic years. This has resulted in low quality education, insufficient equipment, and inadequate classroom areas among others. A JICA report (2001) observed that many managerial difficulties such as lack of systems to monitor the employment status of graduates, lack of school self evaluation system to measure the performance of the polytechnics, limited relations with the industrial sectors and lack of motivation schemes for teachers entangle polytechnic education in Ghana.

Nijhuis (2005), writing on a Netherlands initiated school improvement programme in Ghana, contended that Polytechnics in Ghana tend to rely on foreign books which are often not suited for the Ghanaian context. Further, industrial attachments for students are not well structured and supervised. The same report also indicates that nearly 30% of the polytechnic graduates could not find appropriate jobs after graduation and therefore shifted into other schemes or had to begin their academic career all over again. Another research by the Vrije University, in the Netherlands on Ghana showed that the polytechnics have problems related to equipment and quality of education. The same study also revealed that teachers lacked counseling skills. Moreover, there is a weak link between the polytechnics and the industries resulting in few jobs for the polytechnic graduates.

Atakpa et al., (2007) evaluating the CBT programme for the same Civil Engineering programme at Takoradi Polytechnic reported that the students are satisfied with the curriculum rationale and content, however, the students complained about heavy work loads. The same report stated that the traditional method of lecturing is used and students are not given enough opportunity to practice the skills learnt for mastery at the required level. Also there were problems with students' assessment. Misko (2001), argued that there are formal and informal mechanisms which enable schools to link up with the industry. Formal linkages have a direct impact on what happens in the classroom by specifying what must be delivered. Informal mechanisms are often those arrangements established to enable the implementation of certain policies and legislation. According to the same research, the industries have the formal role of identifying

competencies and standards that must be delivered by schools. This calls for the development of industry competency standards, which would form the basis of the curricula. The linkage must also specify the responsibilities of employers, teachers and trainees with respect to how they must behave in the workplace.

From the point of view of Smith & Wilson (2002), any effective long-term school-stakeholder collaboration requires not only broad involvement, but also continuous nurturing of partnerships, so that all the partners recognize and appreciate the long-term benefits and risks for themselves and, more importantly, for students. Burrows et al. (2001), contended that the first step in developing effective stakeholder collaborations is taking stock of the range of partners in the given community. It is important to engage partners early in the process in order to foster a sense of empowerment and ability to influence and shape the system. Moreover, different partners require different types of support or reassurances in sustaining the relationship.

According to Hall (1996), sound policies have the potential of enhancing school-industry relationships and these of course bring mutual benefits to all concerned. Sound policies help bring about the paradigm shift needed to engage polytechnics in the required change processes. Edwards (2001) suggested that efficient and effective public policy development should be systematic and collaborative if better policy outcomes are to be achieved in the future. King et. al. (2000), further called for the identification of strengths and weaknesses in existing programmes as a way of improving the quality of education. Nijhuis (2005) has suggested improvement in equipment such as ITC facilities, textbooks and equity in terms of salary between polytechnics and universities. Also, the polytechnics should be given institutional autonomy and there should be improvements in the relationship between the industries and the polytechnic, equipment and infrastructure. The same study also recommended the need to organize fund raising activities to generate own income instead of relying on the government. The Danish Evaluation Report (2005) suggested that schools should increase their communication with the companies by offering regular opportunities for practical training.

## Research Questions

The research was guided by the following research questions:

1. What is the quality of polytechnic education in Ghana?
2. How can an effective polytechnic-industry relationship be built and sustained in Ghana?
3. What modifications need to be done in order to improve the quality of CBT approach?

## Methodology

To investigate the quality of polytechnic education in Ghana and how polytechnics can effectively link up with the industries, data was collected from both internal and external stakeholders. Various data collection methods and respondents were employed. The case study approach was employed for an in-depth study of the issues involved.

### *Population and Sample*

Participants were taken from Takoradi Polytechnic and some industries. The study involved seven staff members and 118 students from the Civil Engineering Department of Takoradi Polytechnic; 35 past students and 25 employers (from 21 companies). Industries in four regions of Ghana

(Central, Greater Accra, Volta and Western were involved. The research was carried out in the Civil Engineering Department because the department is currently using the Competency Based Training (CBT) approach. It is also about to evaluate its activities under the ongoing Netherlands government's project with the Polytechnics in Ghana. The stakeholders considered included: students, teachers, alumni, and employers. The polytechnic views the students as their primary customers who receive their educational services; employers as stakeholders who hire the students; and department members as stakeholders who teach students the knowledge needed to perform the job. The four regions of Ghana were chosen because they are perhaps closer to each other and helped to collect much data within time (6 weeks).

### *Data Collection*

There was an interview guide in addition to four different structured questionnaires for lecturers, alumni and employers. The questionnaires were pre-tested at Takoradi Polytechnic (staff and students) and Ghana Ports and Harbor Authority (employers and alumni). The needed changes were then made.

The following data collection methods were used:

*Interview*: An interview guide was used to obtain information on the context of polytechnic education, the quality of education, the implementation of the competency based education, quality assurance and suggestions for improvement from the head of department. The interview data served a supplementary role to the structured questionnaires and provided an in-depth view of the polytechnic education system.

*Document Analysis*: Students' records and administrative documents were studied to obtain information on staff proportions, qualifications and student population

*Questionnaires* –Four different types of semi-structured questionnaires were prepared for employers, alumni, lecturers and students. These dealt with the quality of education, the implementation of the competency based education, inadequacies in the programme and suggestions for improvement.

The Civil Engineering Department, the Head of Department, lecturers and students (all second and third year students) were chosen purposively. The department was chosen because it was about to evaluate its curriculum under the ongoing Netherlands govern-ment's project with the Polytechnics in Ghana. Snowball sampling strategy was adopted in choosing respondents from the alumni and employers. Few respondents chosen accidentally or with the aid of the department, or the liaison office were asked to recommend other people who qualify as respondents and were willing to participate in the research. This process was continued until the required number of respondents was reached.

## Data Analysis

After the data collection, a series of activities were carried out. First the data was coded. The codes adopted were as follows: strongly disagree = 1, disagree = 2, undecided =3, agree = 4, and strongly agree = 5. Excel computer programme was used to do the analysis. The appropriate number for each datum was placed in the appropriate data file for the analysis. For open ended questions, the following procedure was adopted: the gathered data was read in the context of the setting and the purpose of the research; chunks of data that demonstrate

some commonalities were identified; it was worked through once again to identify patterns, themes, differences and then it was reported on.

Summaries of all responses under each quality indicator were then given, thus illustrating the percentage that strongly agreed, agreed, were undecided, disagreed or strongly disagreed. Strongly agree and agree were then combined to form one strand of response and the same was done for strongly disagree and disagree; undecided also formed another strand of response. This approach was appropriate for easy application of the evaluation criteria. The evaluation criteria were then used to make value judgment about the quality of each quality indicator and component. A summary of the weaknesses and strengths of the programme were then given in written form and by using descriptive statistics. The criteria below were adopted:

If 40% or more of the respondents averagely rate strongly disagree/ disagree = Not acceptable

If 40% or more of the respondents averagely rate undecided = Just acceptable.

If less than 50% of the respondents averagely rate strongly agree/agree = Weak

If 50 - 59% of the respondents averagely rate strongly agree/agree = Satisfactory

If 60 - 69% of the respondents averagely rate strongly agree/agree = Good

If 70 - 79% of the respondents averagely rate strongly agree/agree = Very Good

If 80 - 100% of the respondents averagely rate strongly agree/agree = Excellent

If 40% or more of the participants on the average strongly disagreed/ disagreed with statements about the quality of an indicator/component, it implied that, that quality indicator/ component was very weak and not acceptable. A quality indicator/ component was judged just acceptable if, 40% or more of the respondents were undecided. A quality component/indicator was

considered satisfactory if 50-69% of the respondents strongly agreed/ agreed with statements on it. If 70-79% of the respondents rated strongly agree/agree, a quality indicator/component was judged very good and finally if 80-100% of the participants rate strongly agree/ agree it implied that, that quality indicator/component was excellent.

## Results and Discussion

The research involved twenty-one companies, members of staff and students (second and third years) of the Department of the Civil Engineering of Takoradi Polytechnic. The respondents outside the school (employers and alumni) were fifty–six; fifty–two males and four females. They were engineers, managers, supervisors, surveyors, and training assistants. Four of the employers had masters' degrees, nine had first degrees and 12 had diploma certificates. Those from Takoradi Polytechnic were made up of seven members of staff (all males, including the Head of Department) and 118 students; 117 males and a female. Three of the

staff members including the head of department, had master's degrees; one had a first degree; two had diploma certificates; whilst one member of staff did not indicate his qualification.

## General Overview of Quality Indicators

The general state of the curriculum is satisfactory. Stakeholders generally considered the quality of the entire programme, the preconditions and the output to be satisfactory. Further, they indicated that the quality of the educational processes used in achieving the stated outcome and the satisfaction of stakeholders were good. However they were dissatisfied with the organization of the programme and the level of research.

In the same way, quality assurance was seen to be weak and the quality of facilities used in achieving the desired outcomes was not acceptable. Also the quality of guidance and counseling services rendered to students was not acceptable. Table 1 presents the details.

**Table 1**

**General Overview of Quality Indicators**

| Quality Indicator | Average / % | | | Remarks |
|---|---|---|---|---|
| | SA / A | U | SD /D | |
| CBT Programme | 53 | 15 | 32 | Satisfactory |
| Preconditions | 58 | 10 | 32 | Satisfactory |
| Process | 60 | 4 | 36 | Good |
| Output | 59 | 16 | 25 | Satisfactory |
| Satisfaction | 69 | 12 | 19 | Good |

SA=Strongly Agree; A=Agree; U=Undecided; D=Disagree; SD=Strongly Disagree

**Source: Field Work, 2008**

### *Programme*

Considering the programme in general, the study showed that the quality of the curriculum rationale and design were good, and that of the content was satisfactory.

However, stakeholders were dissatisfied with the implementation of the programme and the quality of research. The major aspects considered were: the curriculum rationale, design, content, organization and research (Table 2).

**Table 2**

**General Overview of Quality Components - Programme**

| Quality indicator | SA/A | U | SD/D | Remarks |
|---|---|---|---|---|
| Rationale | 64 | 17 | 19 | Good |
| Curriculum Design | 72 | 14 | 14 | Very good |
| Content Adequacy | 55 | 17 | 28 | Satisfactory |
| Organisation | 28 | 13 | 59 | Not acceptable |
| Research | 46 | 14 | 40 | Weak |

SA=Strongly Agree; A=Agree; U=Undecided; D=Disagree; SD=Strongly Disagree

**Source: Field Work, 2008**

## Table 3

**General Overview of Quality Components - Preconditions**

| Quality indicator | SA/Agree | U | SD/D | Remarks |
|---|---|---|---|---|
| Quality Assurance | 49 | 19 | 32 | Weak |
| Student Intake | 100 | 0 | 0 | Excellent |
| Staff Intake | 53 | 9 | 38 | |
| Satisfactory | | | | |
| Facilities | 30 | 12 | 58 | Not acceptable |

SA=Strongly Agree; A=Agree; U=Undecided; D=Disagree; SD=Strongly Disagree

**Source: Field Work, 2008**

### Process

The details of the quality component process are presented in table 5. The research divided the entire process used in achieving the stated goals into six parts: efficient use of time, quality of teaching, teaching load, study load, assessment/feedback, and guidance and counseling.

The study revealed that the programme makes efficient use of time and the quality of teaching is satisfactory. Also, the teaching load and the quality of assessment/ feedback are good. Further, the research showed that the programme is weak when it comes to guidance and counseling services and students are overloaded with work.

## Table 4

**General Overview of the Quality Components - Process**

| Quality indicator | Average /% | | Remarks | |
|---|---|---|---|---|
| | SA/A | U | SD/D | |
| Efficient use of time | 52 | 12 | 36 | Satisfactory |
| Quality of Teaching | 57 | 19 | 24 | Satisfactory |
| Teaching Load | 60 | 4 | 36 | Good |
| Study Load | 37 | 20 | 43 | Not acceptable |
| Assessment/Feedback | 62 | 15 | 23 | Good |
| Guidance/ Counseling | 33 | 17 | 50 | Not acceptable |

**Table 5**

**General Overview of Quality Components – Output/Satisfaction**

| Quality indicator | Average | | | Remarks |
|---|---|---|---|---|
| | **SA/A** | **U** | **SD/D** | |
| Output | 53 | 16 | 31 | Satisfactory |
| School to Work | | | | |
| Transition | | | | |
| Satisfaction | 47 | 20 | 33 | Weak |
| Employers | 82 | 10 | 8 | Excellent |
| Alumni | 69 | 7 | 24 | Good |
| Staff | 80 | 14 | 6 | Excellent |
| Student | 46 | 15 | 39 | Just acceptable |

SA=Strongly Agree; A=Agree; U=Undecided; D=Disagree; SD=Strongly Disagree

**Source: Field Work, 2008**

## Discussion

Almost all the respondents were concerned about the level of professional practical training for students. It was asserted that practical work is gradually being relegated to the background. This was attributed to inadequate facilities (e.g. workshops, laboratories, etc); teaching/learning materials (lap tops computers, power point projectors, drawing studio and laboratory equipment); and lack of regular evaluation of the programme. In fact, the polytechnic can not make changes in the curriculum without the consent of the National Board for Professional and Technician Examination (NAPTEX) which is quite bureaucratic. Mention was also made of the fact that curriculum does not adequately address real practical work and there are inadequate modern and relevant textbooks in the library. As a result, too much emphasis was placed on theory. Practical sessions and supportive staff during practical lessons were inadequate in addition to the fact that some of the laboratories are not in proper working condition. The obvious alternative has been too much reliance on the industries for

The results of this research also showed that the relationship between the polytechnics and the industries in Ghana was quite weak. Nijhuis (2005) confirms this by saying that there is a weak link between the polytechnics and the industries in Ghana and this has resulted in few jobs for the polytechnic graduates. In a similar way, the Danish evaluation report (2005) indicated that the contact between schools and companies offering practical training is quite modest. The situation in Ghana can be explained by the fact that, there are currently few functioning industries in Ghana and the importance of effective stakeholder collaboration has not been very much nurtured and realized. Also to some extent, the relationship between the polytechnics and the industries is restrained by limited available resources.

Mayer et al. (2001), observed that programme quality is enhanced when teachers have high academic skills, teach in the field in which they are trained, and have more than a few years of experience. The study showed that out of the seven staff respondents, only three of them qualified as lecturers (the minimum qualification for a lecturer in any Polytechnic in Ghana is a master's

degree) despite the fact that many of them were experienced teachers. It was also indicated that the quality of the facilities used for the intended outcome is very weak. This is in consonance with what Nsiah Gyabaah (2005) found. He reported that the Polytechnics in Ghana have insufficient equipment, and inadequate classroom areas etc. Another research by the Vrije University on Ghana showed that the polytechnics in Ghana have problems related to equipment. Hirakawa et al. (2005) argued that even if teachers learn practical skills with new kits and equipment, they cannot transfer the same practical lessons to their students without the necessary kits and equipment. They went on to explain that in the aspect of equipment, some of the equipment have not been utilized because of lack of repairers and inadequate financial resources. This same reason explains the situation in Ghana.

The study further indicated that quality assurance is weak in the programme. This finding is very important because of the role quality assurance plays. According to Mayer, Mullen, and Moore (2001), quality assurance provides fact-based external confidence to stakeholders that educational

certificates would meet their needs and expectations. At the time of the research, there was no official contact between the department and the alumni and/or the industry, even though sometimes when lecturers visit students on attachment they unofficially come into contact with them. Also most of the students have not taken part in any form of school self evaluation despite the fact that they deemed it necessary. Recently, a quality assurance unit was set up but its presence is yet to be felt. Partly because of lack of rapport between the polytechnic and the labour market, only a majority of those employed (48.3%) indicated that they found a job easily after graduation and are satisfied with their current jobs. This is similar to what Nijhuis (2005) found. She stated that 30% of the polytechnic graduates in Ghana could not find appropriate jobs after school and therefore shifted into other schemes or had to begin their academic career all over again. These findings are in contrast to a student outcome survey conducted by NCVER (2005) which showed that 75% of the graduates employed were satisfied with their jobs. The partial difference between the two studies is explained by the fact that, there are few industries in Ghana and hence the vast majority of the

workforce in Ghana is in the services and the agricultural sectors. Unfortunately, most of the services are bureaucratic when it comes to employment and are limited with respect to facilities. Also the per capita income of Ghana is about 5% (Conference of Ministers of Education of the African Union COMEDAF, 2007) and this limits employment creation. On the other hand, many young people are added to the labour force each year and this makes employment more difficult. The difficulty in finding jobs have injected in most workers the attitude of 'let take it like that' even though they do not have job satisfaction.

The need to develop and sustain the relationship between the industries and the polytechnics was very much emphasized. According to Misko (2005), the purpose, benefits and roles of each partner must be clearly defined and made known to all concerned at the beginning of the relationship. He further stated that the industries should have the formal role of identifying competencies and standards that must be delivered by schools. This of course, calls for the development of industry competency standards, which would form the basis of the curricula. The responsibilities of teachers and trainees with respect

to how they must behave in the workplace must also be specified. Atchoarena et al., (2002) also stated that the school authorities should call upon employer associations to collaborate with training institutions in defining together the training to be adapted in order to meet their needs. A Danish evaluation report (2005) further suggested that information on employment, qualifications and training needs from professional organizations should be solicited.

In modifying the programme as a way of meeting employer needs collaboration with the industries was emphasized. Hirakawa et al. (2005) also recommends strengthening stakeholder collaborations for improved educational quality. For instance an informal communication approach, such as visits to the companies at the beginning of a new practical training period by a regular contact person for a more focused discussion about the programme can be employed. In deed this requires appropriate resources but the institution can embark on activities meant to internally generate income instead of relying solely on the government. From here, the curriculum can be redesigned/review using relevant experts in the field so that much attention would be given to practical training and employer needs.

## Conclusion

The research sought to improve the quality of Polytechnic education in Ghana by investigating how the effectiveness of polytechnic-industry collaborations can be maximized and how the use of CBT approach in the Ghanaian polytechnic context can be improved. From the finding of the study, a number of conclusions were drawn in accordance with the research questions as indicated below:

*What is the quality of polytechnic education in Ghana?* The study revealed that generally the quality of all the quality indicators (programme, pre-conditions, process, output and satisfaction) was satisfactory or better. However, stakeholders were dissatisfied with the organization of the programme, quality assurance and research. Moreover the programme lacked regular evaluation.

*How can an effective polytechnic-industry relationship be built and sustained in Ghana?* The study showed that there is the need for the polytechnics to liaise with the industries to determine qualifications, and competency standards, instead of relying so much on the curriculum. They can

also partner each other in research and other mutually beneficial activities. Also the relationship needs to be nurtured in other to sustain it.

*What modifications need to be done in order to improve the quality CBT approach?* Prominent among the recommended modifications were the need to: regularly redesign/review the polytechnic curriculum, improve facilities, improve relationship with industries and improve monitoring systems.

## Implications

The consideration of these issues forms the basis for recommendations for future policy development, implementation, improvement and research.

### *Policy makers*
Sound policies will help bring about the paradigm shift needed to engage polytechnics in the required change processes. This should be done systematically and collaboratively.

The culture of regular school self evaluation should be institutionalized in all Polytechnics in Ghana. Also, other school self evaluation methods such as peer review could be adopted.

Research should be made a core activity for both staff and students in higher vocational education. Special attention should be given to relevant real life problems and their solutions. Also the research skills of staff should be an important component of staff assessment and promotion.

### *Polytechnics*

The polytechnics should liaise with the industries to determine qualifications, outcomes and competency standards, instead of relying solely on the curriculum. The ethics of a profession should be an important part of the curriculum.

The Polytechnic should develop partnerships with the industries by way of consultancy, collaborative research, development projects, joint training programmes, and job placements in addition to student internship. In doing these the polytechnics can create opportunities for staff and students to be at the frontiers of new industry knowledge and trends.

When students are on attachment, there should be regular follow ups on them and their assessment should have both theoretical and practical aspects.

A management board should be set up in every polytechnic to oversee the use, regular and routine checks on school facilities and equipment (E.g. laboratory, workshops or equipment).

The conditions of service of polytechnic workers, especially lecturers should be improved as a way of motivating and retaining quality staff in the polytechnics.

## Research

The research findings underscore an area in which further research is needed and this is recommended for further research.

A long-term follow-up research on students' outcomes is necessary, to learn more about the relative effectiveness of competency based training on students and employment. This research could not conduct a long-term study on student outcomes because of time. Hence, the ideal study should examine the benefits the students might have gained from competency based education and training (CBT), years after graduation. Information about their employment status, further education, income level and evidence of the connection between CBT on these outcomes should be examined. This study is important because currently, the department has plans of running new programmes using the CBT approach. It would be worthwhile to find out the cost effectiveness of this approach in order to judge alternative approaches.

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