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Adoption of competency based education in TVET Institutions in Ghana: A case study of Mechanical Engineering Department, Accra Polytechnic

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Polytechnics education in Ghana, as it is now, lacks proper direction. Indeed, Poku et al. (2013) stated that education in Ghana can be described as being under experimentation, without a very clear direction and focus. It is observed that Polytechnic education which is meant to enhance trainee's practical abilities and prepare them effectively for the world of work has been degrading gradually. Many polytechnics in Africa do not possess adequate laboratory facilities, the linkages with industries are totally broken, their curriculum has become obsolete and do not respond to the market need. All these factors have negatively affected young graduates of polytechnics for years back. It is extremely difficult for them to value themselves and access a job available on market. Some few who are lucky to be employed have to undertake a certain number of training in their industry in order to meet the job requirements. In view of these problems, this paper proposes the adoption a Competency Based Education (CBE) Approach to re-strengthen the practical skills, the linkage with industry and finally improve work accessibility to Polytechnic's graduates in Ghana. A case study of Competency Based Education (CBE) program in Mechanical Engineering at Accra Polytechnic (Ghana) was considered from 2009 to 2013. Secondary data were collected on student rate of employment each year for both the normal Higher National Diploma (HND) program and the CBE program. Analysis shows that the CBE approach enhances job accessibility better than the normal programmes and at the same time equips trainees with considerable skills required in industry. However, the limited number of students enrolled on the CBE program, the lack of awareness and proper readiness for CBE approach, have contributed to limit the effective implementation of the CBE system in Ghana.

Keywords: CBE, polytechnic education, employment, practical skills transferred.

INTRODUCTION

Polytechnics were created in Ghana by the law 1992 (Provisional National Defense Council Law 321) in order to deepen the educational reform in Ghana. Polytechnics which are Technical Vocational Education and Training (TVET) type of education are meant to provide tertiary education being the training and retraining of upper

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and middle level manpower which is conceived by the government of Ghana as an essential component of development strategy to steer and manage economic and social development so as to achieve national goals (White Paper, No. 0001/97). At the beginning, six polytechnics were created namely Accra, Takoradi, Kumasi, Ho, Tamale and Cape Coast polytechnics. Four more polytechnics were later established at Sunyani, Koforidua, Bolgatanga and Wa bringing the number of Polytechnics in Ghana to ten (Honyenuga, 2013).

Moreover, Polytechnics activities in Ghana are regulated by three main bodies namely: National Board for Professional and Technician Examination (NAPTEX), National Council for Tertiary Education (NCTE) and National Accreditation Board (NAB).NAPTEX not only takes control of the examination process but also ensures that a unique curriculum is run in the ten polytechnics. The polytechnics normally awards an HND certificate obtained after passing through three years of training and fulfilling some minimum conditions.

According to Effah and Hoffman (2010), Tertiary Educational Institutions have distinct features from other organisational types that in turn make their management different. Since their establishment, Polytechnic suffered a lot of problems as identified by many previous studies. It was previously argued that Polytechnics have received less adequate funding and stable support as compared to universities. Effah and Hoffman (1998) have noted that, polytechnics in 1998 received about 28% of inputs requested from government; this percentage appreciated to 58% in 2000. Moreover, Nyarko (2011) summarized the problems faced by the polytechnics as following: poor funding, inadequate staffing, curriculum, career progression, poor remuneration and autonomy. Idrissu et al. (2014) further develop more challenges faced by the polytechnics in terms of high enrollment, lack of effective laboratory tools, obsolete equipment and curriculum delivery. The polytechnics curriculum is common for the ten polytechnic and is subject to review by NAPTEX. It should be noted that the polytechnics curriculum which is develop with the intention to enhance practical skills and re-empower middle level manpower is not Competence Based oriented and therefore is gradually deviating from its main objective. Competency-based learning or Competency Based Education and Training is an approach to teaching and learning more often used in learning concrete skills than abstract learning. According to Soarez (2012) Competency Based Education is an outcome based approach to education where the emphasis is on what comes out of postsecondary education –what graduates know and they can do- rather than what goes into the curriculum.

Moreover, laboratory facilities that are required to enhance practical training have been progressively degrading, forcing facilitators to make their teaching more theoretical than practical. The polytechnic education as it is now does not have a clear direction just like Poku et al. (2013) stated it earlier that education in Ghana can be described as being under experimentation, without a very clear direction and focus. In addition, the linkage to industry that strengthens the practical skills of trainees is also getting wicker and wicker. All these factors seem to make polytechnic teaching very similar to the university approach which is recognized for its theoretical perspective rather than producing practical skilled people as set by the objectives of polytechnics. This situation explains the motivation of this paper to propose a Competency Based Education (CBE) approach to enhance polytechnic teaching and align this with the already set objectives. This will also impact on the process of employment as the CBE approach directly aligns skills with industry training. Specifically, the project will achieve the followings: Assessing the potential of employment provided by the CBE curriculum and comparing this vis-a-vis the current TVET program.

METHODOLOGY

A CBE program run by the mechanical department of Accra Polytechnic in collaboration with Japan International Cooperation Agency (JICA) has been used as a case study to analyze this problem. The CBE program which was a pilot one proposed by the Japanese association (JICA) in collaboration with Accra Polytechnic, ended in 2013 providing therefore limited data to perform a deep quantitative analysis. The program started since 2009 and was run with the financial support of JICA for the PLANT students of the mechanical department. The CBE program in PLANT, was run concurrently with the normal PLANT program of the school. Enrollments over the years are summarized in the Table 1. It can be seen from Table 1 that the enrollment for normal HND students is far higher than the one of the CBE program despite the fact that the registration fees were the same. The reason is that there is a fixe and limited number of students that were taken for the CBE program and once this limit is attained, no more admission is given. The CBE program in PLANT is normally announced to the students during the orientation ceremony and those who wish to attend the program do register for it. Additionally, data were collected on the graduating students and this is shown in Table 2.

The third series of data that help to make a comparative analysis of the CBE program versus the current HND program is the rate of employment of students over time. For the CBE students, there was an attempt to build a comprehensive database on their employment rate by the mechanical department through a survey that is still on-going. However, a random sampling was used to locate the students for both the CBE and the normal HND students. The data collected for the CBE program and the current HND program are presented as follow in Tables 3 and 4 respectively. The population for the CBE students who graduated is 41 and the one for the normal HND students is 102.

Based on the information collected in both Tables 3 and 4, a cumulative number of student versus duration before employment was inferred and presented in Table 5.

FINDINGS AND DISCUSSION

A plotting of the cumulative rate of employment for both the CBE and the normal TVET program for HND is displayed in Figure 1. According to Figure 1, the

Table 1. Enrollment of students in Plant program since 2009.

Yrs	No of students enrolled for the CBE program in PLANT	No of students enrolled for the normal HND program in Plant
2009 to 2010	20	60
2010 to 2011	22	62
2011 to 2012	22	70
2012 to 2013	Unknown	Unknown

Table 2. Graduating students in Plant program since 2009.

Yrs	No of students enrolled for the CBE program in PLANT	No of students registered for the normal HND program in PLANT
2009 to 2012	19	49
2010 to 2013	22	53
2011 to 2013	Unknown	Unknown
2012 to 2013	Unknown	Unknown

Table 3. Accra Polytechnic, Plant student's employment rate for CBE program.

Company's name	Date of graduation	Date of starting job	Duration in month	No of student Employed
Tropical cable	November 2012	January 2013	2	4
NexansKabelmetal	November 2012	November 2012	0	8
Accra Brewery	November 2012	March 2013	4	2
Nestle	June 2013	September 2013	3	2
VRA	November 2012	May 2013	6	2
Ghana Gas pipeline	November 2012	December 2012	1	6
CFAO Ghana	June 2013	August 2013	1	1
Mechanical Lloyd	June 2013	October 2013	4	2
Aluworks	June 2013	September 2013	3	6
Sun-Ray Engineering	June 2013	July 2013	1	2
Cocoa processing company	June 2013	September 2013	3	1
Tema steel works company	November 2012	May 2013	6	1

employment rate for the CBE program is faster than the one of normal HND program. However, this result cannot be confirmed at 100% due to the non-availability of massive data that could lead to a more statistically sound analysis. In fact the data collection was the most challenging aspect of this work. The data collected on the CBE program is enough representative of the total population but this has not been the case for the normal TVET HND program. One of the deficiencies the researchers suffered was the fact that there were no proper measures put in place to keep track the graduated students in order to build a strong database on their workplaces and date of employment. In view of this, it is recommended that alumni services should be re-strengthened to improve those records.

A total of 27 out of 102 students were successfully tracked with their working places for the normal HND program against a total of 37 over 41 for the CBE program. Despite all these factors, the graph in Figure 1 shows an undeniable trend in favor of the employment rate provided by the CBE program as compared to the normal TVET HND program.

Discussion of findings on direct observations

This finding is subject to a lot of changes in terms of infrastructure. The full implementation of a CBE program in Ghana will be highly limited by factors including the number of students enrolled, the Internally Generated

Table 4. Accra Polytechnic, plant student's employment rate for normal HND program.

Company's name	Date of graduation	Date of starting job	Duration in month	No of student taken
Tropical cable	November 2012	January 2013	2	2
NexansKabelmetal	November 2012	November 2012	0	2
Accra Brewery	November 2012	March 2013	4	6
Nestle	June 2013	September 2013	3	1
VRA	November 2012	May 2013	6	0
Ghana Gas pipeline	November 2012	December 2012	1	2
CFAO Ghana	June 2013	August 2013	1	0
Mechanical Lloyd	June 2013	October 2013	4	0
Aluworks	June 2013	September 2013	3	2
Sun-Ray Engineering	June 2013	July 2013	1	0
Cocoa processing company	June 2013	September 2013	3	0
Tema steel works company	November 2012	May 2013	6	1
Tema Oil Refinery	November 2012	March 2013	4	2
Bluemont Engineering	November 2012	September 2013	10	1
Jofed company ltd	November 2012	October 2013	11	1
Vital Source ltd	November 2012	August 2013	09	3
Pinnacle Engineering	November 2012	November 2013	12	2
Itema	November 2012	August 2013	09	1
Karmans Holdings ltd	November 2012	February 2013	3	2
Volta Aluminium company	November 2012	January 2013	2	1

Table 5. Cumulative data analysis for both CBE and normal HND.

CBE		Normal HND	
Duration (month)	**Rate of employment (%)**	**Duration (month)**	**Rate of employment (%)**
0	19.5122	0	1.9608
1	41.4634	1	3.9216
2	51.2195	2	6.8627
3	73.1707	3	11.7647
4	82.9268	4	17.6471
5	82.9268	5	17.6471
6	90.2439	6	18.6275
		7	18.6275
		8	18.6275
		9	22.5490
		10	23.5294
		11	24.5098
		12	26.4706

Fund (IGF) provided to the schools and the available infrastructures. For instance, for the CBE program to accommodate 100 students which is the average number of enrolment per year in most departments running the TVET program, there will be a need to engage four lecturers per course for a close monitoring of the students and provide more infrastructures including laboratory equipment, computer resource centers with access to internet. These limitations put much pressure on the school administrators without effectively increasing their IGF as the fees do not vary whether the student attend the CBE or the normal HND program. These financial limitations have contributed one way or the other to the unsustainability of the program and this bring forth the

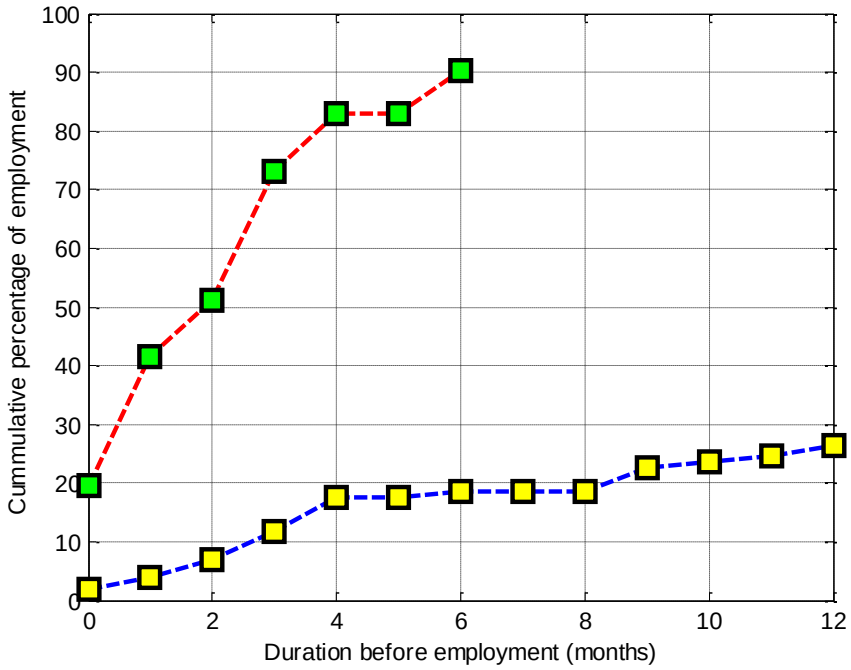

Figure 1. Graph showing the rate of employment over time for both CBE and normal HND program.

question of effective implementation of CBE program. In actual fact Dilmore et al. (2011) proposed a 13 steps process and 3 steps implementation procedure to ensure that a CBE program in clinical research is properly implemented. A key element in the process is the review of existing CBE program. Even though CBE programs are gradually being adopted in Ghana, awareness and readiness for such change in educational sector have not yet reached a considerable threshold to trigger an effective change. Financial support appears therefore as a serious handicap in implementing CBE programs.

However, the study shows that the CBE program enhances employability better than the TVET program but surely accommodates a far limited number of students.

According to Kpamma et al. (2014), the Competency-Based Training (CBT) system departs from the traditional mode of training by focusing post-secondary training on defining, teaching, and assessing competencies industry requires. Therefore unlike the conventional system whereby the unit of progression is time and teacher-centered, in a CBT system the unit of progression is mastery of specific knowledge or skills, and is learner-centered. Also industry partners develop more appreciation to the CBE students owing to their comfort with equipment and ease of operating machines. They do not request extra training to perform their duty as compared to the many other from the traditional program to whom the industry appears to be totally new. The CBE program can produce skilled technicians capable of transforming the economy of our country to the next level of industrialization and at the same time reduce youth unemployment and eradicate poverty to some extent. These great benefits cannot be underrated and this is the reason why this study strongly recommends the adoption of CBE in TVET institution in Ghana as the country is actually in its developing stage and this will require more technical skills in manufacturing and related industries. An appeal is therefore made for all stakeholders to invest more in the polytechnic and improve the state of laboratory equipment as well as provide more infrastructure and adequate tools to adopt a CBE program. This will be a choice of quality education against a high number of enrolled students. Otherwise, the current state of education program in Polytechnics in Ghana will continue degrading and turn to be more theoretical than practical.

CONCLUSION

In summary a comparative analysis of employment rate for CBE program and TVET HND program in mechanical department option “PLANT” was carried out. It was found out that the CBE program improves job accessibility and therefore it is highly recommended to polytechnics. CBE provides many other advantages including increase practical activities, effective capacity building and

linkages with industry, easy job placement. It is for these reasons that the CBE system is fully adopted in Australia and other part of the world like Japan, China etc.
It is further recommended that a deeper analysis based on more data including cost and other factors should be carried out to assess the sustainability of a CBE program in Ghana and also the factors that limit an effective implementation.

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Conflict of Interests

The authors have not declared any conflict of interests.

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