

An assessment of an intramural preliminary course of study as a viable alternative matriculation pathway to traditional examinations into the Bachelor of Engineering programme at the University of Technology, Jamaica

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ABSTRACT: The progress of 38 students entering the Bachelor of Engineering programmes at the University of Technology, Jamaica (UTech) in Kingston, Jamaica, including the first batch of Prerequisite Course of Study (PCS) programme matriculants, was monitored for the entire duration of the degree programme, ie from 1999 to 2004 inclusive. The group consisted of students with a mixture of qualifications from the Caribbean Examination Council (CXC), Caribbean Advanced Proficiency Examination (CAPE), the UK-based General Certificate of Education Advanced Level GCE A' Level and the University's own Preliminary Course of Study (PCS). The grades of the students' performance in the matriculation examinations and in every course of the BEng degree were recorded for analysis. The results of the analysis indicate that although the CAPE/A' Level students' performance was consistently above the PCS students, there seemed to be no significant difference between the levels of performances throughout the engineering programme.

INTRODUCTION

The number of students leaving secondary school programmes possessing and possess the necessary qualifications for applying to enter directly into the Bachelor of Engineering programmes at the University of Technology, Jamaica (UTech) in Kingston, Jamaica, is not sufficient to run a cost effective programme, and meet the needs of Jamaica and the Caribbean for sustainable economic development [1]. The reality is that all the tertiary institutions within Jamaica and regionally (Caribbean and North America) are competing for the same pool of students to pursue careers not only in engineering but other science disciplines as well.

Students entering engineering programmes must have a good background in the sciences. This is not the case at the UTech in that only a *few* students have the prerequisite grades and subjects that qualify them to articulate into the BEng programmes. Furthermore, these *few* students are being considered for other professions such as medicine, law, etc.

Mathematics and physics at the Caribbean Advanced Proficiency Examination (CAPE) or A' Level are required to matriculate into the engineering programmes. However, according to a *Jamaica Observer* newspaper report from 22 August 2005, the number of entrants in these subjects is very low [2]. Of the six most popular subjects as shown in Table 1, *Pure Mathematics Unit 1* is the only subject that has any relevance to engineering and science matriculation.

From the information obtained, it is of note that the number of students who have sat those subjects that are required to articulate into engineering programmes (even without considering passing grades) is inadequate (note: Grades A and B for A' Levels, and I and II for CAPE) [1].

Table 1: The six most popular subjects in 2005 (as per the *Jamaica Observer*, 22 August 2005) [2].

Subject	Number of Candidates	
	Region	Jamaica
<i>Communication Studies</i>	5,055	2,810
<i>Caribbean Studies</i>	4,481	2,262
<i>Management of Business Unit 1</i>	2,614	1,130
<i>Pure Mathematics Unit 1</i>	2,325	1,930
<i>Sociology Unit 1</i>	2,065	1,075
<i>Management of Business Unit 2</i>	1,240	643

The Prerequisite Course of Study (PCS) programme was developed in the Faculty of Engineering and Computing at the UTech [3-6]. It was intended to be used as a diagnostic tool to determine the suitability of students without traditional entry qualifications (A' Levels and CAPE) for the engineering programmes. It consists of a one-year (two-semester) programme where mathematics, physics, chemistry and biology are taught to a level that is equivalent to CAPE and A' Levels, together with communications, workshop technology and technical drawing, but with a difference in that the syllabi contents are geared towards the engineering programmes. In addition to being a diagnostic tool, the PCS was introduced as a remedy for the shortfall in the number of qualified students available for engineering programmes with the following expected benefits:

- Increase the number of students eligible to pursue a course in engineering;
- Give students with ability who may be victims of the poor quality within the secondary schooling system a reprieve and the opportunity to pursue their careers at the tertiary level, and engineering in particular;
- Improve the institution's ability to produce engineers in adequate numbers and of the right quality to meet Jamaica's and the region's economic objectives;

- All the students in the PCS programme are being prepared to pursue engineering type degrees;
- Students are allowed to choose the engineering discipline of their choice after one year;
- Students at an early age are able to mingle with the more mature engineering students at an early stage of study that helps them to adjust to the university environment and engineering studies in particular.

The first cohort completed the BEng programme in 2004. The study presented in this article is intended to evaluate the performance of these students and to compare them with students who matriculated in the traditional manner over the four-year period. Figure 1 shows the matriculation paths for students at the UTech and the University of the West Indies (UWI).

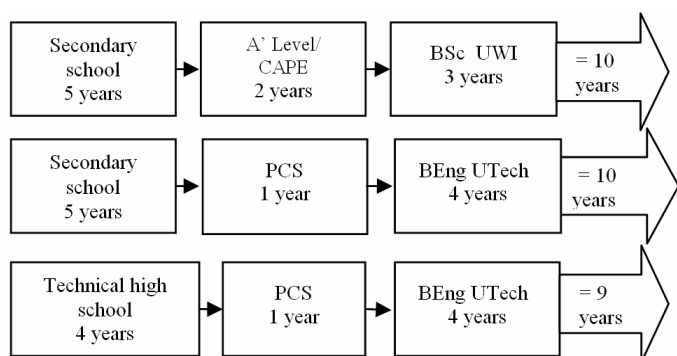


Figure 1: Matriculation paths A' Level and PCS for the UWI and UTech.

Purpose of Study

The study presented here is designed to ascertain if the PCS is a suitable alternative to CAPE and A' Levels for matriculation into the BEng programmes within the UTech and for other tertiary institutions to recognise the PCS as an equivalent qualification should the findings of the study prove positive.

Methodology

This information was placed in a database designed specifically for the research and will be updated on a periodic basis for future research. It also serves to assess the validity and reliability of previous findings and the effect of the changes made to the PCS programme in 2002 [7]. The appropriate statistical techniques (averages, standard deviations, ranges, etc) were applied in the analysis to meet the requirements of this research. Some of the information contained in the database is as follows:

- Student name and ID;
- Age at entry into the programme;

Table 2: Average GPA and range for PCS and CAPE matriculants.

Group		Year 1 GPA	Year 2 GPA	Year 3 GPA	Year 4 GPA
PCS	Average	2.30	2.74	2.65	2.96
	Minimum	1.26	1.65	1.54	1.12
	Maximum	3.06	3.31	3.37	3.74
CAPE/ A' Levels	Average	2.69	2.92	3.00	3.19
	Minimum	3.00	2.25	1.65	2.43
	Maximum	3.51	3.55	3.37	3.74

- Secondary school attended;
- Qualification at entry including subjects and grades;
- Performance on the PCS programme inclusive of subject grades and GPA;
- Performance in the BEng programme inclusive of subject grades and GPA for each year and each semester.

The performance of students from each of the matriculation paths was analysed and compared at each stage of their progression, ie from high school to completion of the BEng degree. The level of performance to which the students performed within each articulation group was analysed to determine if there was a link between the competence-based outcomes of the PCS to the courses in the BEng programme. The attrition rates were analysed in order to identify weaknesses within the respective matriculation paths that affected student performance.

The database construction consists of five tables, specifically:

1. The registry;
2. High school information;
3. PCS data;
4. BEng data;
5. GPA data.

All five tables are linked together such that information from any combination of tables can be extracted with a single query.

Queries were designed and tested to extract the relevant information from the database as it related to the research questions. The queries were used in the design and generation of the appropriate reports.

CONCLUSIONS

The results of the analyses indicate that although the CAPE/A' Level students' performance is consistently above the PCS students, there seems to be no significant difference between the levels of performances throughout the engineering programme (see Tables 2 and 3, and Figure 2). Therefore, the PCS seems to be a suitable matriculation for engineering programmes at the UTech. Additional data will be added to the database and analysed to further establish the validity of these results.

Table 3: Average four-year GPA and range for PCS and CAPE matriculants.

	4-Year Average GPA PCS	4-Year Average GPA CAPE/A' Levels
Average	2.66	2.95
Minimum	1.39	2.07
Maximum	3.37	3.54

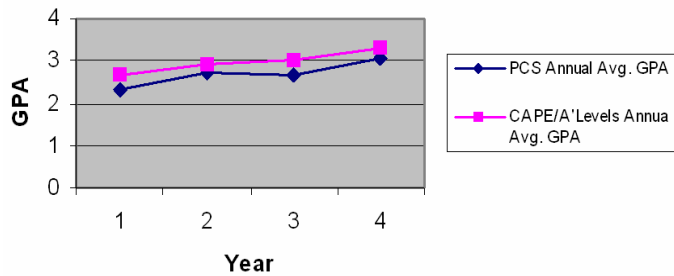


Figure 2: PCS and CAPE/A' Level average GPA.

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under the theme:

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