

Academic Performance of International Students in Electrical Engineering at the University of Queensland

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***Abstract:** In this paper we study the academic performance of the large cohort of international students enrolled in the Bachelor of Engineering (Electrical) program at the University of Queensland. The need for this study arises from the extremely rapid internationalisation of the Electrical Engineering program over the past five years and the possible consequences of this growth on graduate quality. We conclude that the international students perform as well as, if not better than, domestic students. Thus international student quality does not appear to represent a major limiting factor when examining limits to program growth.*

***Keywords:** international, Singapore, electrical engineering, performance*

Aim of this Study

The aim is to compare the academic performance of international students enrolled in the Bachelor of Engineering (electrical) program at the University of Queensland (UQ) to domestic students mainly recruited from the South-East Queensland region. Electrical engineering (EE) has experienced strong growth in international students over the past 5 years. For this reason, it is timely to review the performance of the international students to ensure that the quality of the Electrical Engineering program is not being degraded as a result of the rapid international growth. We need to address the following questions:

1. Are international students comparable in quality to the domestic students?
2. Are particular overseas institutions providing higher quality students than the average?
3. Can UQ continue to grow international fee income from the EE program without damaging the reputation of Electrical Engineering?

Background

Engineering at UQ had a cutoff Overall Performance (OP) Score of 8 (equivalent to TER 85) [QTAC (2003)] in January 2002 and a median OP of 3 (TER 97). These scores mean that the academic standard of student enrolling in engineering programs is among the highest of any major program at UQ and indeed the State of Queensland. Many of the better engineering students select EE after year 1. Moreover EE is the most popular single degree representing about 25% of the graduating engineers in 2001 — about half of these EE graduates are currently international students.

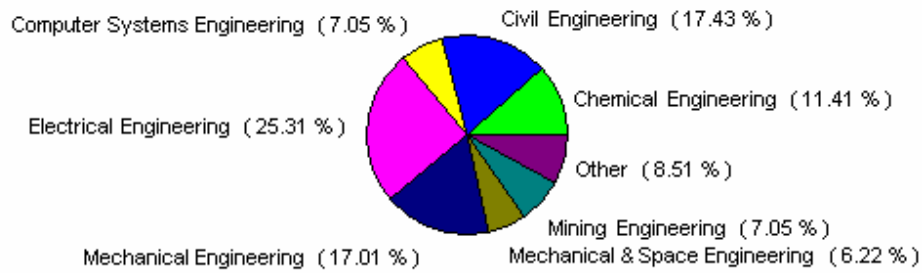


Figure 1 Engineering Graduates by Plan (2001)

EE Program Growth

Electrical Engineering has experienced very rapid growth over the last five years as shown in Figure 2 — indeed the graduating numbers have more than doubled. As the number of domestic students is controlled by university quota which is controlled, in turn, by government funding, the growth has largely been in the number of international fee paying students. Nevertheless, overall growth has been additionally boosted by modest domestic increases despite the quota barrier. Due to the engineering quota, higher domestic demand for engineering has resulted in a rise in the OP cutoff rather than an increase in domestic numbers over the years.

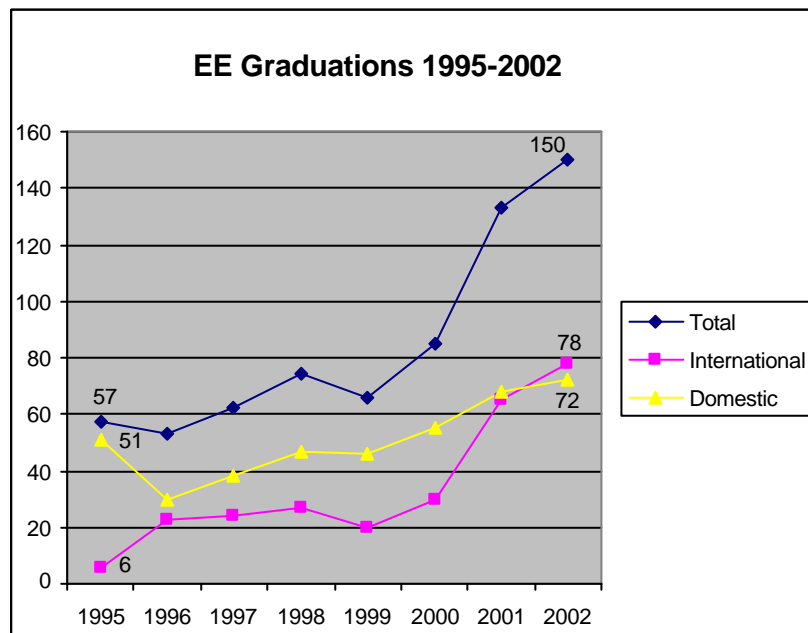


Figure 2 Growth in EE Graduates over last 5 years

Electrical Engineering was the number 1 program at UQ for generating full-fee income from international students in 2002. In the same year, EE overtook traditional high full-fee revenue business programs, such as commerce and business administration, for the first time.

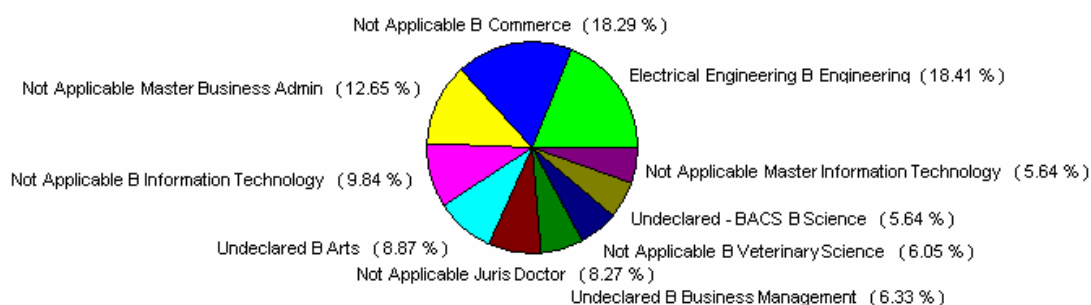


Figure 3 Comparison of Top 10 International Tuition Fee Earning Programs at UQ

Asian International Markets

Primarily the growth in international students within the EE program is driven by the growth in the Singapore market. Although key academic staff have been encouraging market diversity through regular visits to Hong Kong, India, and China, Singapore is still the dominant market. The majority of these students have a polytechnic diploma and upgrade to a UQ engineering degree with our two-year diploma to degree program. The diploma to degree program is a well-integrated subset of courses from years 2, 3, and 4 of the standard 4-year EE degree schedule. The international students enrol in exactly the same classes as domestic students and compete on an equal basis for marks over the final two years of the course. Apart from a special orientation program at the beginning of study, absolutely no concessions are made for international students as a matter of UQ and School policy.

Singapore polytechnic diplomas in electronics, communications, and electrical engineering and related areas are suitable for the diploma to degree program. Students are currently granted two years credit, if their diploma GPA is above 4.5:

New EE Curriculum

The new EE curriculum at UQ started roll-out in 1997 and is based on the Carnegie-Mellon University model of engineering education as described by Director, Khosla, Rohrer, and Rutenbar (1995). After five years of experience with this model, we endorse the authors' conclusions expressed as follows:

"We believe the real impact in engineering education will be made only by looking at the curriculum as a whole, in the context of present technological and societal needs, and not just by constant repolishing of aging courses. There are advantages to be found in taking a fresh, unfettered look at the undergraduate curriculum."

The resulting curriculum at UQ has a significant similarity to that developed at CMU, but retains a strong flavour of the activities and interests of our local engineering environment. The key ideas of the new engineering curriculum are:

- Engineering courses begin in the first year, concurrent with mathematics, science, and an exposure to other engineering disciplines. The core of required "essential" engineering classes is small.
- Area requirements across a spectrum of relevant, topical engineering areas replace most specific course requirements.

- Breadth, depth and coverage are mandated across this spectrum of technical areas, but individual courses are not prescribed; students flexibly choose from among available topic areas.
- Nearly three quarters of a year of the curriculum may be completely unconstrained.
- A proportion of the "essential" engineering classes is allocated to the development and practice of team, management, and communications skills.

Results and Methodology

Domestic and International Students were compared on the basis of mean cumulative Grade Point Average (CGPA) and the distribution of grades over their final years of study for all year 3 and 4 students currently enrolled in EE in semester 2, 2002.

Category	Mean CGPA
Domestic	5.10
International	5.26
Poly 1	5.28
Poly 2	5.25
Poly 3	5.11
Poly 4	5.33

Figure 4 Comparison of Mean CGPA

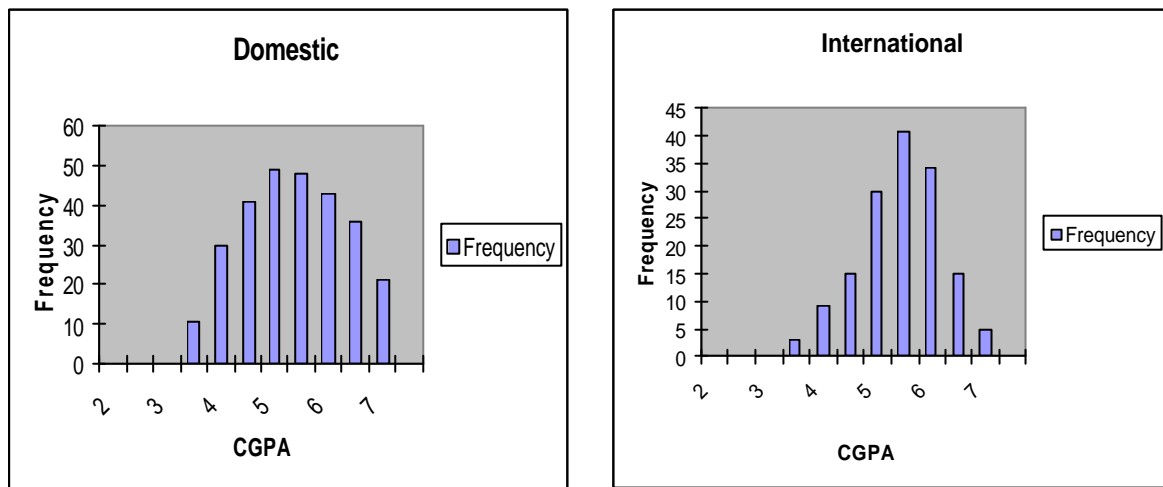


Figure 5 Comparison of CGPA Grade Distributions Overall

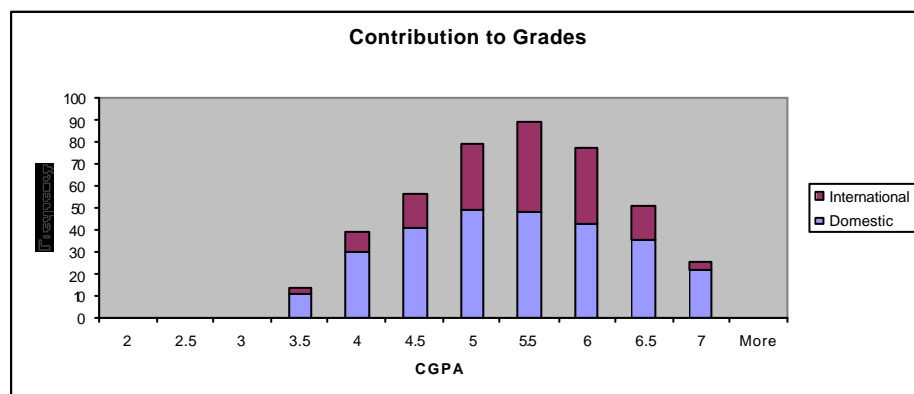


Figure 5 Overall Contribution to Grades

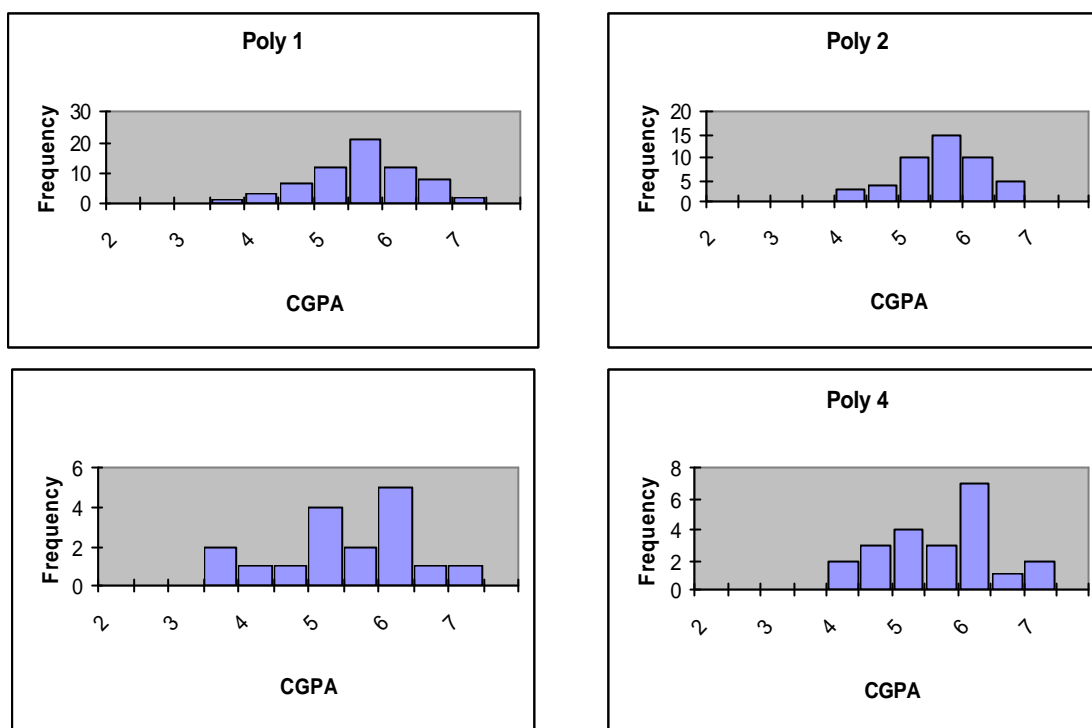


Figure 7 Comparison of Grade Distributions by Institution

Discussion

The comparison of means shows that the average international student is performing as well as, if not better than, domestic students. Considering the high standard of the domestic student entering engineering compared to the UQ average, this is a surprising and pleasing result.

Some academic staff have commented that there are few really bright international students and that many are just getting bare passes in our courses. They argue that the School should therefore actively reduce the number of international students to boost graduate quality. Clearly, the analysis just does not support this view and shows that international students from Singapore are indeed well represented among our top engineering graduates. The spread of performance of international students is less than for domestic students, but they are well represented both above and below the mean CGPA.

UQ appears to attract a similar standard of student from all four Singapore polytechnics, so there is a good case for treating the poly diplomas from each institution equally as is the current practice. Note that the uneven distribution of grades for some polytechnic is most likely explained by the smaller numbers of students from these institutions.

Conclusions

- The performance of international students in this study is as good as, if not better than, domestic students.
- International students are well-represented among top UQ graduates, so internationalisation does not necessarily lead to a drop in academic standards as has been reported elsewhere in the Australian university system.
- The four Singapore polytechnics produce graduates of similar standard.

- The current cut-off GPA of 4.5 for granting two years advanced standing to Singapore polytechnic diploma holders is probably set at about the right value — If anything, it is slightly high. This cutoff yields students with academic performance similar to domestic students.
- Despite the academic quality of the international students in this study, there are other limits to growth of the EE degree program including space, staffing, and dilution of the engineering culture.
 - Building accommodation is tight and EE staff are now spread across 6 separate buildings due to office and laboratory space shortages. Some modest refurbishments are underway but the proposals provide very little additional space.
 - For various reasons, the Electrical Engineering program has been unable to hire engineering staff at a rate comparable to student body growth.
 - Engineering culture is hard to define, but it is a factor in choosing our institution and distinguishes our Alumni from graduates of other universities. Anecdotal evidence suggests that once international students approach 50% of the graduating cohort, it is very difficult to maintain a cohesive culture and give a proper Australian university experience.

References

QTAC (2003) [Online] http://www.qtac.edu.au/what_you_need/cutoffs_web.pdf, last visited 7/4/2003