Selling Engineering - A Role Model Program

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Abstract

The decline of the recruitment of students into engineering programs in Australia has been a progressive phenomenon for many years. Aside from the reduction in numbers there is also a perception that the preparedness of entrants has declined.

There have been initiatives from the professional engineering body, Engineers Australia, industry groups, employers and educational institutions and private interested parties to try to address and reverse this trend. To do so requires encouragement for, and the commitment of, secondary students to study mathematics and the sciences with fulfilling engineering careers as a goal.

The engineering faculty at Central Queensland University (CQU) in the early 1990's established an Engineering Role Model Program that utilised current engineering students to visit local secondary schools and 'market' and 'sell' engineering as a profession and also specifically, the engineering programs of CQU. Students were recruited to be Role Models, auditioned and then trained to 'spread the word' on the potential and attractiveness of engineering as a career and CQU as a quality provider of engineering education. Role Models were encouraged and expected to 'get personal' and give their personal stories of where they came from, their prior and current perception of engineering careers and study, and develop a rapport with the secondary students

The initial Role Modelprogram in the mid 1990s was successful and resulted in increased student numbers, but with the departure of key staff and a re-alignment of faculty priorities was discontinued by the late 1990's. It was re-established in 2001 resulting in an increase in student recruitment numbers of 63% the following year, but again due to competing priorities was allowed to fall away with insufficient resourcing. It was again undertaken, with less than ideal timing, in 2004 resulting in an increase of 33% in CQU Bachelor of Engineering new enrolments, defying the national downward trend. With the recognition of the Role Model program's importance in attracting higher numbers of quality students, its support and re-invigoration is a priority for the faculty for 2005 on.

Introduction

How to attract appropriate secondary students into engineering programs at University (and for that matter TAFE) has been a major consideration for many institutions, and organisations such as Engineers Australia, for a considerable period of time. A associated aim of this has been how to specifically target and recruit under-represented groups in the community into

engineering. It has been widely and particularly considered that attracting more women into engineering programs should be a major focus of recruitment initiatives.

In 1994, the then Faculty of Engineering at Central Queensland University developed and introduced a Role Model Programs, as an initiative of the Women in Engineering Committee. This focussed on increasing the representation of females in the commencing student cohorts of the Bachelor of Engineering program at CQU. This initiative drew on work developed from intervention strategies designed to appeal to, and encourage, the participation of women in engineering programs. Programs had been established elsewhere in Australia that engaged women professional engineers speaking to female high school students about their perceptions and experiences as engineers[1]. With Central Queensland University established in Rockhampton, a regional centre with a relatively small and diverse engineering population, there were difficulties in finding sufficient practicing female professional engineers to be the Role Models and conduct the presentations. A reconsideration of the situation led to the conclusion to utilise CQU's own female engineering students as the Role Models.

The co-incidental introduction in 1994 of the Co-operative Education Bachelor of Engineering program ensured that senior students would be able to provide a personal perspective for prospective female engineering students. This would of course only be after their completion of their co-operative education placements.

A broader consideration and recognition of the potential benefits of this Role Model program as a more general marketing exercise for the Bachelor of Engineering, the Faculty and University, led to its support at the different levels in the University. The original focus on the recruitment of more females into the Bachelor of Engineering programs was expanded to the full range of secondary students.

What is a Role Model Program?

The term Role Model can have varying connotations. Generally, in the widest sense it could be taken to mean an individual is "perceived as exemplary, or worthy of imitation"[2] and inspires others "through personal contact and relationships"[3]

A more complete definition could be: *an individual, who inspires through personal contact and observability, can inspire for "good (or ill)", can personify behaviours that build self-esteem …. The Role Model, like a mirror, helps the beholder to see the self* [4]. This can perhaps be best summed up as the person to whom the Role Model is being presented, coming to the determination "I want to be like them".

A Role Model Program could therefore be considered to be a formal process, whereby people it is hoped to influence are exposed to personal exemplars, whose knowledge, skills and attitudes will be considered important and are desirable to emulate. A Role Model program should specifically:

- be sensitive to the audiences and participants needs and expectations
- be flexible to adapt to varying contexts
- develop networks
- incorporate ongoing participatory feedback for program improvement
- be adequately resourced
- include Role Models with relevant knowledge skills and attitudes, accessible and able to establish audience rapport

- incorporate an approach by Role Models consistent with the program's philosophy
- provide concrete reminders of the message of the Role Models[5]

The First CQU Engineering Role Model Program - 1994 to 1997

There were three issues for the program in 1994:

1. Focussing on female recruitment, being the aim of the Women in Engineering Committee
2. Broadening recruitment focus to all potential students
3. Raising the profile of engineering programs at CQU, the Faculty and University

A number of Role Model Program objectives were established to provide:

- from a 'Women in Engineering' perspective:
  - increased recruitment of females into engineering programs
  - secondary students with the opportunity to reflect on the gender imbalance within engineering programs
  - male secondary students with insights into female students' perceptions and experiences in mathematics and science study and their under-representation in engineering study and the engineering profession
  - a positive image of equal partnership of females and males in engineering teams
- from a general marketing perspective:
  - an enhancement of secondary students perspectives of engineering as a profession and the engineering faculty and CQU as an exemplary provider of engineering education
- from an engineering student Role Model personal/professional development perspective:
  - development of their appreciation of engineering as a profession
  - development of their communication skills
  - development of self confidence
  - contributions to marketing
  - development of a broader perspective of gender diversity in engineering
- from a gender imbalance perspective
  - provide female Role Models for female secondary school students
  - explore issues of gender imbalance through forum discussions[6]

It was recognised that some form of training would be beneficial for engineering students before they were 'let loose' in schools. Initially, it was envisioned that information sessions should be sufficient. However it was considered that with the dual focus on recruitment and the Role Model's personal and professional development, more formal training would be worthwhile. This was based on work done in a Secondary Schools Link Program conducted by the University of Wollongong[7]. The training program was established with a series of interactive sessions, based on an experiential learning model, now more commonly defined at CQU as Project Based Learning.

In 1994, seventeen third and fourth year Bachelor of Engineering students were recruited as potential Role Models. Over an eight week period, the students participated in structured weekly sessions where they were informed of the faculty's expectations for the school visits and were encouraged to develop a presentation imprinting their own persona into it. As far as possible, teams of two were established of one female and one male student, tasked with school visits – on their own without any staff participation.

One aspect of the session discussions was how little knowledge of engineering the students had, prior to entering the engineering program. The general consensus was that the choice of field of study was based on the fact that a family member was an engineer, or that a friend was going to do it, or that it was something more specific than a science degree! There was also a generally expressed belief that secondary school staff had very limited knowledge of the engineering profession and engineering programs.

The Role Model Training Program -1994 to 1997

It was established for 1994 that a sixteen hour training program over eight weeks should provide the necessary background, and appropriate knowledge for the student Role Models to be comfortable in presenting.

As an introduction, the students in their first session reflected on what 'Engineering' meant to them and bounced ideas around with other students and staff, most of whom had significant experience as professional engineers.

Initially Role Models were given a brief to develop an oral presentation, supported by overhead projected visuals. Their presentation was to incorporate:

- Personal experiences and influences in:
  - choice and study of mathematics and sciences at secondary school
  - consideration and choice of engineering as a career
  - consideration and selection of CQU
  - experiences to date in CQU engineering program study
  - life at University
  - engineering industry experience (if appropriate)
- Their perceptions of:
  - professional engineering practice
  - study of an engineering program
  - CQU's engineering faculty
  - CQU and its student support services

An issue was to steer the Role Models toward an inclusive representation of an engineer, engineering study and engineering practice to present to their audiences. Initially Role Models tended to think of typical engineer stereotypes – dirty clothes or pinstriped suits (an interesting dichotomy), men in hard hats clutching rolls of plans on-site with calculators and a breast pocket full of pens proliferated.

Prior to their commencing study in the engineering program at CQU, the Role Models said they had expected engineering study to encompass grappling with mathematics and science as they learned how to design things. In the CQU program, even then, wider issues such as communication, teamwork and social issues were presented. There was still perceived to be an overwhelming emphasis on mathematical manipulations in the course of engineering concept and theory development. This followed on to producing a design that achieved a specific technical objective. As such, it was not surprising that the Role Models wanted to define engineering as 'technical design'. A significant part of the 'training program' then revolved around broadening and deepening perceptions though brainstorming with students. Students, on reflection, provided such epiphanies as engineering was "(the) *process of taking a series of thoughts, using available knowledge and resources and turning these ideas into*

reality" and *"creative art forms with theory to enforce its existence"* and *" link between invention and reality"*[8].

With the expansion of their perceptions of what engineers did, what engineering was and why CQU was a wonderful place to study engineering, the Role Models were let loose. They travelled in pairs of mostly one female and one male, descending on unsuspecting schools with their personally developed presentations to woo the next potential intake of engineering students.

Role Model Visits 1994 -1997

A total of 44 secondary schools within CQU's catchment area of Central Queensland (in a radius of approximately 500 kilometres from Rockhampton) were visited in 1994 by the Role Models, over a three week period. Very positive feedback was received from the engineering students about their acceptance in the schools and the secondary student responses. Secondary students seemed to generally appreciate and respect the Role Models and a rapport was seen to be established in the course of the presentation between the Role Models and their audiences.

The Role Models were also presented as potential mentors to their audiences with their personal profiles and contact information given out to the students in their audience. It was hoped that secondary students would feel comfortable enough to contact the Role Models in their deliberations about an engineering career or commencing study in an engineering program. For students actually commencing study in an engineering program at CQU, there was the expectation that they would be able to establish contact with the Role Models and for them to act as mentors in the course of their studies[9].

The Role Models valued their experiences and most expressed their appreciation for the considerable learning and personal (and professional) development they felt they had achieved. It was considered that the program was beneficial for them in significantly improving their self confidence and communication skills as well as re-enforcing their realisation of, and commitment to, the engineering profession for a career.

There were two measures that could gauge the success or otherwise of the Role Model Program. On the one hand its external success would be represented by an identifiable increase in the recruitment and retention of students into the CQU engineering programs. On the other a less quantifiable result was the personal and professional development of the Role Models.

As can be seen from Table 1 below, from 2004 to 1998 there was an increase, and then stabilisation, in commencing numbers into the Bachelor of Engineering programs, attributable to the Role Model programs.

The contribution to the Role Model's own personal development is not able to be quantified. However, the fact that many Role Models chose to recommit the following year citing the value and fun of their experiences, and that staff commented on Role Models capabilities in regard to their communication, interpersonal and self confidence, suggests there were significant benefits for students.

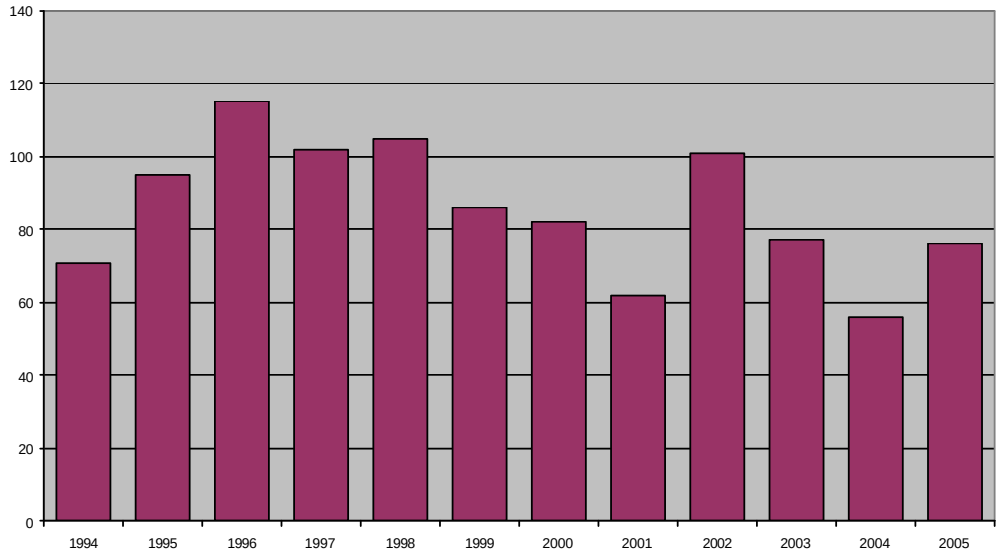

Table 1 Commencing Students CQU BEng

The Role Model recruitment, training and school visits program was progressively compressed over the next four years, due to the time and resource commitments for both Role Models and staff. Staff from both the Engineering Faculty and University Support Services volunteered their time to organise and conduct Role Model recruitment, training and school visits, in addition to their normal duties. With staffing changes, competing priorities and changes in the focus for marketing and recruitment, demands on particularly staff but also student time, it became increasingly difficult to maintain the program. The Faculty was the host for the 1998 AaeE 'Waves of Change' Conference and Convention in Gladstone. Its organisation utilised significant time of most of the same small number of staff who conducted the Role Model program, so the program was quietly shelved in 1998.

A Bumpy Road – The Role Model Program 1998 - 2004

The Faculty's management underwent a significant restructure in 1999 with the appointment of a new Dean, who changed the external focus of the Faculty. It ultimately caused a cessation in any educational program marketing or business development. It was promulgated that this was not an activity that had any appreciable significance or importance to the faculty! Needless to say, the next three years without any specific program marketing saw a decline in student intake into the Bachelor of Engineering programs as can be seen also in Table 1 above. Fortunately for this aspect of the faculty's operations (and many others besides), the tenure of that Dean was short-lived. However with the dislocation caused, it was not until 2001 that an effort was again made to re-establish a Role Model program.

With the re-stabilisation of the faculty management, in 2001 a new Role Model program was established, based on the previous model but with particular streamlining. It was recognised that the importance of providing similarly aged young people with a similar lexicon and interests was important in achieving credibility with potential students. However, with the knowledge of the previous program and it's somewhat 'hit or miss' approach through the variableness of engineering students' knowledge of the overall program and career opportunities, a different approach was taken.

Selected faculty staff were now the focal point of the program. All had been practicing engineers and were acknowledged as people with whom engineering students demonstrated an affinity and therefore it was hoped they could establish a rapport with secondary school students.

The 2001 Role Model program was structured around a tight two week period in August targeting specifically Year12 Physics classes in all secondary schools in Rockhampton, Gladstone, Mackay and Emerald – the major towns in the Central Queensland region.

Primarily first year and some second year students were identified as being suitable and approached to assist in the program. Almost without exception, all agreed to be involved and were paired – one female with one male student and assigned a staff member. A formal PowerPoint presentation was prepared, highlighting the key points it was felt would attract and inform potential students and that all presentations were to follow. The staff member (in the dual role as a lecturer and also professional engineer) generally started the presentation, and then 'threw' to the Role Models during the presentation. The Role Models were primed to bring into the presentation their thoughts and perceptions about the program, their experiences in tertiary education, tertiary life as a student and their expectations and aspirations for the future. Approximately 30 schools were visited.

In 2002 new enrolling students in the Bachelor of Engineering increased 63% on the figures for 2001. Thus it was accepted that the 2001 Role Model Program had been a success. Again due to competing priorities in 2002, with an Institution of Engineers Australia Accreditation of all engineering program at CQU, the decision was taken to not conduct a Role Model program in 2002. The result was a downtown of 25% in commencing students in 2003. With a very tight rein on staffing resources again in 2003, limited ad hoc Role Model programs were run. These did not occur at the most opportune times and had a patchy coverage of schools and classes. Needless to say, the commencing student numbers in 2004 the following years decreased again 25%.

In 2004 a more targeted, concerted and organised effort was made, with the mostly same approach as previously. The key differences were:

- proper co-ordination of school visits
- calling for expressions of interest from first, second, and third year students
- specifically approaching students considered most suitable
- ensuring all who volunteered were utilised, but
- matching students to particular schools in areas
- better preparation of the Role Models in their preparation
- developing a more appealing presentation
- the Role Model pair doing the complete presentation
- a staff member accompany the students as back-up if required
- the staff member developing a relationship with school staff

The Role Model Program targeted schools in Rockhampton, Gladstone, Mackay, Emerald and now Bundaberg and Brisbane. One issue was the lateness most school visits occurred, however as a result, commencing Bachelor of Engineering program enrolments increased in 2005 by 33% in comparison with a reported trend nationally of negative 7%.

Whilst the focus recently has been very much on the recruitment of students, the engineering students' participation as Role Models has been reported by the students as being rewarding in terms of their personal and professional development. It is however recognised that a proper reward for their efforts should be realised. Currently under consideration is the establishment of a 'Community Service' elective course as part of the degree program. This course would have formal learning outcomes, structure and portfolio assessment, to which participation in the Role Model program could contribute. Current thinking is that students could claim an exemption against the Learning Outcomes through participation in the Role Model program, in addition to other activities.

Role Models Refocussed 2005

Reflection on the experience gained from the re-establishment of the Role Model Program for 2001-2004 led to the conclusion that the timing of the Role Model visits was not optimal, and the focus of the visits needed reviewing. The single visit to schools in September was considered to be "too little, too late". Because this timing was close to the QTAC program selection time for students, the presentation focussed on providing students a brief overview of engineering and a detailed explanation of what engineering related programs were available through Central Queensland University.

A review of the Role Model program suggested that revised timing, a more focussed content and a sustainable approach to delivery was needed if the program was to be successful over a longer period. It was recognised that the sessions needed to be delivered to schools earlier in the year, with a follow up towards the student decision time. The objective of these presentations needed to be different, so slightly different presentations needed to be prepared for both sessions.

The refocussed Role Model program now involves two visits to schools in Year 12, the first in April and the second in August – September. Presentations are now made using a computer and data projector that allows use to be made of engineering related photographs in an effort to increase the students interest in the presentation.

The first visit in April is aimed at leaving students with the primary message: "Engineering is interesting and employment is readily available" and a secondary message: "Central Queensland University provides a Co-op engineering program where students can undertake paid work experience while studying". These messages are achieved by spending more time than previously on facets of engineering, and including many photographs of Central Queensland University Engineering Co-op student in the workplace, and less time on specific details of CQU engineering programs. The delivery by BEng(Co-op) students strongly reinforces these messages.

The second visit is to be undertaken in September this year. The primary message will be: "Remember engineering is interesting, now enrol in Central Queensland University's engineering co-op program to obtain up to 16 months of paid work experience while completing your degree." This presentation will provide specific details of CQU engineering programs and, again, delivery will be by CQU BEng(Co-op) students.

With the introduction of the April Role Model visits to schools, first year students could not be used for this presentation as they are only one month into their engineering studies and could not be expected to provide credible experiences to Year 12 students. The April Role

Model visit has been conducted by two person teams of second and fourth year students as third year students are undertaking their work placements at this time. The September presentations will be undertaken by first year and third year students as fourth year students will be on work placement at this time. This schedule allows for "on the job" training of Role Models and ensures the sustainability of the program by targeting specific year students for each series of visits, and scheduling of an experienced and inexperienced student on each school presentation.

At the time of writing this paper, 19 schools within CQU's catchment area of Central Queensland have been visited. The Year 12 students were asked to complete a survey to provide information on which university they intended to attend, influences on their choice of career, and influences on their choice of university. In all, 208 students replied. Of these 208, 54 (26%) responded that they were definitely interested in engineering as a career, and 19 (9%) indicated they were intending to attend CQU, with 24 (11%) undecided as to their choice of university.

At the end of the presentation, students were asked to rate the influences on their choice of career against four criteria, giving a score of 1 for most influential and 4 for least influential. The weighted averages shown in Table 2 below indicate student career choices are most influenced by an interest in an area.

Influencing Factor in choice of Career	**Rating**
Interest in an area	1.5
Employment opportunities	2.6
Career Opportunities	2.7
Starting income	3.1

Table 2. Influencing Factor in choice of Career (Scale: 1 highest; 4 lowest)

Students were also asked to rate the influences on their choice of university against ten criteria, giving a score of 1 for most influential and 10 for least influential. The weighted averages shown in Table 2 indicate university choices are most highly influenced by the features of a specific degree and the reputation of that degree and the university providing it.

Influencing Factor in choice of University	**Rating**
Features of a specific degree	3.2
Reputation of a specific degree	3.4
Reputation of university	3.4
Financial considerations	4.5
Close to home	6.1
Parents influence	6.1
Desire to move to a capital city	6.3
Advice of teachers	7.0
Friends going to same university	7.2
Advice of guidance officer	7.4

Table 3. Influencing Factor in choice of University (Scale: 1 highest; 10 lowest)

The information obtained from this survey validates the development of the Role Model Program to stimulate high school students' interest in engineering, and to use the unique

features of Central Queensland University's co-op engineering program, i.e. the combination of the co-op work placement and the project based learning delivery method of the program, to influence students choice of career and university.

Conclusion

The CQU Engineering Role ModelProgram is a very worthwhile element in the recruitment of students and the attendant viability of the delivery of engineering programs at CQU. It also showcases the engineering programs, their students and staff and the Faculty and University 'brand'. Engineering students, particularly those with industry experience through their Co-operative placement, are a valuable Faculty resource for business development and marketing. As Role Models they benefit through their personal and professional development being enhanced in valuable learning through their active participation in the Role Model Program.

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Biographies

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