Starting to Belong: an O-Week Introduction to Engineering & Sustainability

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Abstract*: This paper reports on the introduction of an innovative Orientation activity designed around the theme of 'Beyond Solve for X' for engineering students at the University of Queensland. The purpose of the activity is to foster a sense of identity and belonging among students operating in small teams by provoking them to explore through a fun, hands-on exercise conceptions of engineering via consideration of sustainability issues associated with the design and build brief. Student feedback indicates enhanced understanding of what engineers actually do, and an appreciation of the opportunity this provides to initiate contact within the first year student cohort.*

Keywords*: Orientation, sustainability, first year experience, engineering roles, conceptions, expectations*

Introduction

Students moving into University engineering programs at the University of Queensland are predominantly school leavers confronted with challenges of transition. Transition encompasses a plethora of issues (an excellent summary is given by MacDonald, 2000), which are being recognized as increasingly significant. There is increasing diversity within the student cohort choosing to enter engineering programs; there is continuing divergence of what is studied as part of engineering programs; and there is a growing debate within academe and the profession about the divergent nature of the engineering profession itself and what this means for the future of the profession (Boshier, 2003, Williams, 2003).

It is therefore not surprising that many students enrolling in engineering have vague conceptions of their future roles as engineers and what engineering encompasses as an

increasingly diverse discipline. They do however seem to have definite ideas on what to expect in their courses. At the University of Queensland a recent survey of first year engineering students (Jolly et al, 2002) was used to explore student expectations of engineering studies and professional practice. A significant theme emerging from the analysis of responses was confusion about the link and a perceived lack of connection between first year courses and engineering roles. The most striking thing about the findings was that many students arrive at University with the expectation of just doing "figures and calculations, ie 'Solve for X'", and are dismayed, bewildered or indifferent when more is required. Many indicated surprise that they are expected to develop, demonstrate and are assessed on team work, communication, and project management skills, as part of their first semester course, Introduction to Professional Engineering. As a consequence, it is a small wonder that new students grapple with the transition process.

The first days, weeks or even years at Universities can also mean isolation and loneliness as previous support networks of friends, fellow students, and teachers become irrelevant to University life. Failure to develop supportive networks and collaborative study groups has been indicated as a contributing risk factor implicated in transition (Tinto, 1993 and Seymour and Hewitt, 1997).

The significance of transition and its impact on students is recognized by educational institutions that have used and reported on a variety of approaches designed to help students manage the process of transition. A Special Issue of the Australasian Journal of Engineering Education addressing Secondary to Tertiary Transition includes papers drawn from universities across Australia that are running residential orientation camps (Crosthwaite and Churchward,2000 and Scott, McKain and Jarman, 2000), and customised first year courses (Anderson and Brady, 2000) addressing transition.

We also recognize the importance of orientation activities in helping students cope with the often confusing experience of furthering their education. It is an opportunity to adjust student expectations where necessary and to begin to demonstrate that we value what we say we value about the development of broader graduate attributes by working with students in team activities and taking the time to communicate with them. Orientation also provides the first occasion to initiate student networks and support resulting from the establishment of learning communities and collaborative study groups. Small team activities are ideal for generating and fostering such contacts. While this is probably best done in a residential camp setting over several days the logistics associated with accommodating a first year intake of over 500 students drawn from across Queensland and Northern New South Wales, plus a small contingent of international students, entering a quasi common first year are prohibitive. As a compromise we introduced in 2003 an all day Orientation Program, incorporating a hands-on small team activity designed to move beyond 'Solve for X' to explore the broader conceptions of engineering practice and to facilitate first contact among students.

The Program

The program for the Orientation is publicised compulsory for all new students and consists of five major components:

1. Welcome from Head of School. This is the conventional and formal welcome and information session run by the Head of School for transmission of institutional information and introductions to staff and senior students active in first year student business.

2. Interactive session with Industry. This is a facilitated discussion/ presentation on engineering careers and professional development with an invited panel of recent graduates representing a range of local industries and engineering disciplines. The intention is to expose students to young dynamic graduates capable of readily connecting with students, to inspire and enthuse them about their futures in engineering.
3. Presentation on information skills and the library. Again this is a conventional part of orientation which is tailored to fit into the overall theme of the day by using the team activity topic to illustrate the extent and role of library services in student life.
4. Lunch with the opportunity to talk to academic and support staff, industry representatives and sponsors including the industry panel presenters, and senior students representing engineering student societies and clubs.
5. Group activity focused on the triple bottom line and sustainable development. The facilitated group activity, Sustainability and the Triple Bottom Line – Crossing the Strait required students to consider the social, environmental and economic implications of a technical solution to the problem of connecting two islands, each having very different technical capabilities, natural resources, societies and cultures.

Triple bottom line group activity

This last small group activity took three hours. Students were allocated randomly to teams of 10. They were introduced and energised with ice breaking exercises (Figure 1) before beginning the team activity in which they were required to first analyse the scenario they had been given in terms of the triple bottom line (Figure 2), and then design, build and demonstrate their solution in terms of that analysis (Figure 3). They had paddle-pop sticks, string and foam cups with which they could do any construction. While only two of the 26 groups went straight to bridge construction, without first undertaking the requested analysis, in fact most of the students solved the problem by building a bridge or something very like it. Prizes were awarded for the most inventive solution and for the most thorough systems approach to the problem.

Discussion of the triple bottom line issues was, in our observation the hardest part of the exercise for most students, and we were impressed by the difficulty they had in sorting out what was environmental, what was social and what was economic about the problem. This is perhaps to be expected with students who have come expecting engineering to be a practical hands-on discipline and with little or no reflection and analysis prior to construction. In our view, however, it also indicates an area where academics need to invest much more energy if they are to produce well-rounded graduates.

Figure 1: Ice Breaking

Figure 2: Analysis

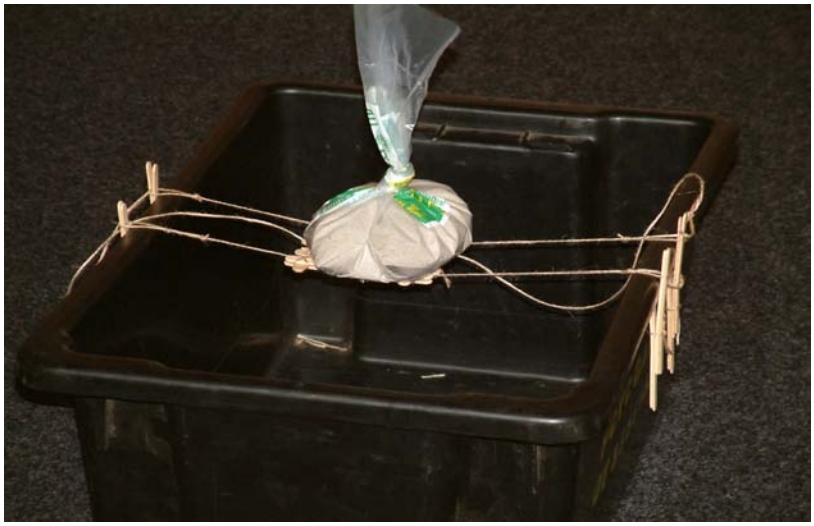

Figure 3: Testing

Discussion

Evaluations from students are summarised in Tables 1 and 2 and indicates that the primary goals of the Orientation Day were met i.e.:
1) students felt they had a better understanding of engineering roles, both within the community at large and what to expect as student engineers, and
2) they had made new contacts they believed would be useful. This was expressed in various ways in the open ended comments invited as part of the feedback. Table 2 shows which part of the day's activities students considered most useful and demonstrates that students used the opportunity to make new contacts, friends, work with other people in addition to the usual information gathering associated with more conventional Orientation sessions.

Question	Agree	Disagree	Don't Know
I now have a better understanding of what engineers actually do	71 (93%)	3 (4%)	2 (3%)
I now have a clearer idea of what will be expected of me as a student	70 (92%)	3 (4%)	3 (4%)

Table 1: Student Feedback on Orientation Goals

Most Useful Session	Response rate
No response	14 (18%)
Everything	5 (6%)
Meeting new people	1 (1%)
Triple bottom line group activity Had to think x 2 Taught communication Have to work with others Made friends x 4 Understand role of engineer x 2 Fun and learning at same time	24 (32%)
Head of School Welcome Informing with important stuff Explained lots of stuff about actual course Actually directly applicable	15 (20%)
Industry Panel Real experience x 3 More info re what to expect Accurate picture of current engineering firms Reassured me – felt I could relate to them Gives an idea of where I'm going	17 (22%)

Table 2: Student Feedback on Individual Sessions

Future Developments

Preliminary assessments of the Orientation Day program from both students and participating staff affirm the program as a positive, high energy event that people appeared to be enjoying and found useful. Improvements being considered for next years event include: integrating and contextualising the introductory, library, and industry sessions with the triple bottom line group activity, increasing the level of interaction in the industry session, better management of the team activity by using three distinct phases - analysis, design and construction and streamlining the collective demonstration and testing of designs and team debriefings.

Research into our student cohort's evolving conceptions of engineering is currently underway and will assist in further evaluating the impact and effectiveness of the Orientation Program with regard to enhanced sense of identity and belonging to the profession.

We also advocate that Orientation is seen only as the first of many steps in a suite of mechanisms that can be used to help guide students through the challenges of transition, and that if it is to be effective it must be supported by continued action, both within the formal program of study and through extracurricular support that builds on the start made with the Orientation Day.

References

Anderson, T. & Brady, B. (2000). Easing the High School – University Transition for Students in Civil Engineering at UTS. *Australasian Journal of Engineering Education*, 9(1), 47-62.

Boshier J. (2003). The Profession formerly known as engineering. *Engineering Australia*. March, 47.

Crosthwaite, C., & Churchward, G. (2000). Reflections on a Residential Orientation Program *Australasian Journal of Engineering Education*, 9(1), 39-45.

Jolly, L., Crosthwaite, C. & Radcliffe, D., (2002). Undergraduate Student Perceptions of Engineering.*Proceedings 13th Annual Conference Australasian Association for Engineering Education.* (165-170), Canberra, IEAust

Macdonald, I. (2000). What do we mean by Transition, and What is the Problem?. *Australasian Journal of Engineering Education*, 9(1), 7-20.

Scott, C., McKain, V.,& Jarman, R. (2000). The Challenges and Benefits of an Orientation Camp for First Year Engineering Students. *Australasian Journal of Engineering Education*, 9(1), 21-37.

Seymour, E., & Hewitt, N. M. (1997) *Talking about leaving.* Colorado, Westview Press.

Tinto, V. (1993). *Rethinking the causes and cures if student attrition*. University of Chicago Press.

Williams, R. (2003). Education for the Profession Formerly Known as Engineering. *The Chronicle of Higher Education.* Jan 24, B12-B13 adapted from *Retooling: a Historian Confronts technological Change.* MITPress, 2002.