

Innovative engineering first year learning space: Early exploration of students' experience at The University of Queensland

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Abstract

This paper describes early research on The First Year Engineering Learning Centre at the University of Queensland. This centre is a multi-purpose space for first year students designed specifically to improve the first year experience and facilitate the development of student networks. Early data reports on the experiences and perceptions of a large cohort of first year engineering students' use of this next generation learning space. This paper will also highlight uses of the space and explore some of the emergent and unexpected student uses and teething problems that have been experienced since it's inception in March, 2007.

Context

The University of Queensland (UQ) is a member of the Australian *Group of Eight* (Go8) research intensive universities. It is typically ranked within the top 3 Universities based on Australian teaching quality and research performance indicators. UQ is the largest and oldest university in Queensland and comprises of three campuses with approximately 35,000 students enrolled, of which about 9,000 are first year students (Data: UQ Reportal). The School of Engineering at the St Lucia campus of UQ, where the First Year Engineering Learning Centre (ELC) is located, is one of the largest engineering schools in Australia. It offers a range of engineering specialisations including Chemical, Civil, Computer, Electronic, Environmental, Mechanical, Mechatronics, Mining and Software.

The UQ engineering program is designed around a project centred curriculum. The first year of the four year program is a common year comprising of core mathematics, foundation engineering and science courses. Students are introduced to project-based learning in their first semester through the flagstone course ENGG1000 *Introduction to Professional Engineering*. This course offers an overview of what is expected in their professional lives by exploring the fundamental aspects of engineering including ethics, risk management, teaming skills, communication and concepts of sustainability. The course utilises the Engineers Without Borders (EWB) Challenge framework as the vehicle for the project component (<http://www.ewb.org.au/ewbchallenge>). The EWB Challenge is a national design competition for first year students centred on a real-world scenario. In 2008 the Challenge will assist rural communities in Cambodia through contributions made by students from around Australia. The judging criteria are aligned to the Engineers Australia graduate attributes. This course enhances student networks by facilitating the meeting of peers and giving students an early taste of a variety of types of engineering.

Students in their second and subsequent years are expected to choose an engineering discipline in which to specialise. These disciplines have dedicated specialist staff, student spaces and discipline-specific student societies giving later years students a well-defined

place to “belong”. Prior to 2005 the first year engineering cohort was largely dispossessed with no central focus outside of ENGG1000. In December, 2005, a First Year Coordinator was appointed by the School of Engineering to develop and manage the first year transitions program and oversee the development and eventual operations of the ELC. There are now a number of programs that operate synergistically to offer first year engineering students welcoming environs in which to embark on their degree. The first year program now takes an integrated approach, weaving elements of the EWB teams challenge, the use of technology, particularly in virtual learning community development and student use of the Engineering Learning Centre. It is impossible to separate the effects of each of these elements on the student experience. The social learning opportunities afforded by the ELC are the focus of this paper.

The first year engineering students

There has been a 47% increase in first year engineering enrolments over the past four years, rising from 568 in 2005 to 930 students in 2008 (Data: UQ Reportal), the largest step being the March 2006 intake (32%). Typically, the cohort consists of more than 90% of school leavers (students under 21 years of age), more than 80% of first year students are male, although it is pleasing to note that there has been a modest increase in the number of females enrolling in engineering. Many of the school leavers (greater than 40%) are the first in their family to attend university; equally, there are also students for whom both parents and at least one grandparent have attended University. The majority of the first year cohort is engaged in paid employment, many of them more than 11 hours per week, which is in line with current trends in Australia (Krause, Hartley, James, & McInnis, 2005).

With the rapid increase in enrolments over the last couple of years, a number of major factors needed to be carefully managed. Transition into academic life provides challenges to many students with the cohort size equalling, and in some cases greatly outstripping, the size of their entire school, students can feel “swamped” by the sheer volume of classmates. It is easy for a student to feel overwhelmed in the sea of new students. The early and strong development of a sense of belonging (Tinto, 1999) is essential in easing this transition. The University of Queensland’s Teaching and Learning Enhancement Plan (The University of Queensland, 2003) identifies supportive learning environment as a vital component to enhancing learning and teaching; “in particular we need to ensure opportunities for peer interaction in study and social environments, recognize the blurring between these two and encourage effective learning communities”(p9).

It is important to note that one of the trends mentioned in the *First Year Experience in Australian Universities* report (Krause, Hartley, James, & McInnis, 2005) is that students are spending fewer hours on campus now than they did 10 years ago. This disturbing trend narrows social learning connections and limits formation of learning communities simply through lack of network opportunities. It is important to add maximum value to the diminishing time students spend on campus. The changing work and study habits of the current generation of students, combined with the nature of the generalist first year program being offered in engineering at UQ, a need was identified to support students by providing a space on campus which they felt *belonged* to them; a space where they could meet with their first year colleagues; a space tailored to the unique needs of students studying engineering.

The Engineering Learning Centre

Significant capital expenditure is being made on learning spaces by universities around Australia (<http://www.uq.edu.au/nextgenerationlearningspace/NGLSscroll.pdf>). As student-centred approaches to teaching and learning are being adopted along with increased diversity of student cohorts, so the change in pedagogic styles is evolving. This is driving the design or redesign of student learning environments. A report compiled for the Scottish Funding Council (Spaces for Learning, 2006) states that “*...engineering students using technology-enabled collaborative learning modes in purpose designed spaces showed an improved ability to solve problems, increased conceptual understanding and reduced failure rates*”. The concept for the First Year Engineering Learning Centre at The University of Queensland was first conceived in late 2004. It was motivated by the desire to enhance the first year student experience, to support the transition to a project-centred curriculum and to augment the early development of graduate attributes.

The main purpose of the Engineering Learning Centre is to enrich the first year student experience by providing collaborative learning and networking opportunities and nurturing a sense of belonging and identity. The centre has been in operation since March 2007 and is now open on a 24/7 basis with access available via student swipe card facilities outside of regular business hours. The centre takes a constructivist approach to learning as the students themselves are the makers of meaning within its walls (Vygotsky, 1978). The design of the centre takes into account how the richness of the environment (use of lighting, colour, form and line) can be used to help students make connections between new learning and pre-existing neural pathways (Valiant, 1996).

By its very nature, modern engineering practice is collaborative and interdisciplinary. A first year learning space with flexible uses was designed to embrace this collaborative landscape. The ELC consists of a large open-plan room with a smaller meeting room, kitchenette and administration area off to one side. It also houses the First Year Coordinator’s office. The open-plan area has large glass walls to the exterior allowing in natural light. It is divided into several zones, each serve a different purpose. The design employs furniture and lighting effects to create 3 distinct environments supporting a range of social and learning spaces. Along one wall is a series of booths consisting of seating, a large table and a module housing a 40” flat screen monitor, computer, audio-visual equipment and data switch. Each booth is controlled by an AMX control system which is, in turn, centrally connected at the lectern situated towards the back of the space but in-front of a wall of whiteboards. The centre of the room contains a number of large tables and benches. Electricity is supplied to these tables via floor ports allowing students to charge laptops, tablets and personal digital assistants (PDA). The opposite side of the room is furnished with large couches and small circular café tables. The furnishings transition across the room from very fixed to very flexible configurations as seen in Figures 1 and 2.

Figure 1
The Engineering Learning Centre

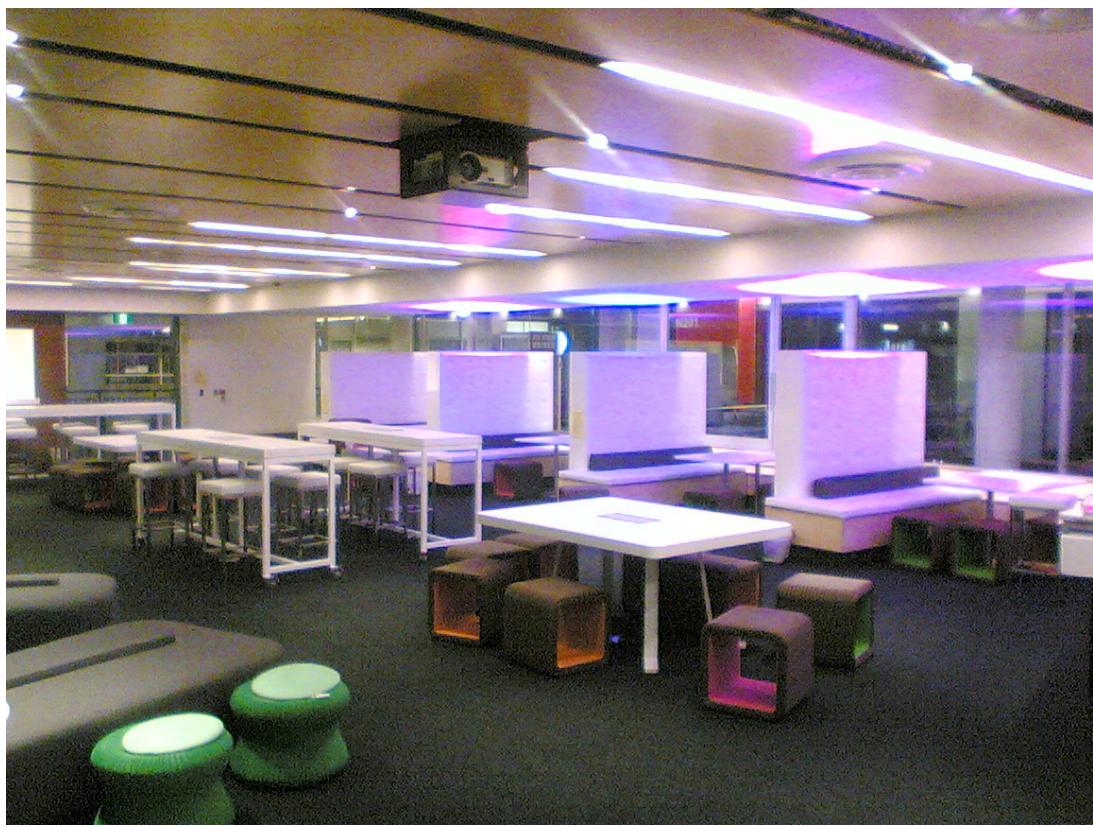
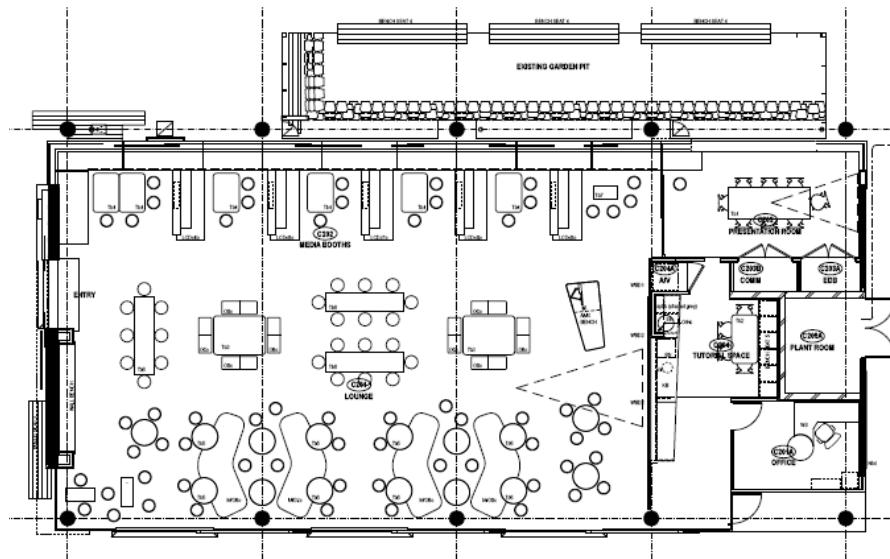


Figure 2
The Floor Plan



It was anticipated that students would use the booths to support their group-based project work, the central area for study groups or collaborative work and the couches would support a more social space enabling students to gather for discussions over a coffee.

Figures 3 & 4

3. Project Team in booth

4. Large table zone



Early indications are showing that the booths and large table zones are being utilized as anticipated (see Figures 3 & 4). It is interesting to note that the use of the social zone has not been as expected. Far from being the relaxation space it was designed for, students instead sit at the tables, sometimes individually, sometimes in groups of up to 5 students, clustered around a laptop or books, with rarely a coffee cup in sight despite the introduction of a coffee cart just outside the door to the ELC. The students use this space in a similar way they would use their homes with friends visiting for a study group (see Figures 5 & 6); the essence of social learning. One student described the centre as a space where "learning happens through interaction".

Figures 5 & 6

5. During a typical morning



6. Same space, late afternoon



As with all things, there have been some teething issues that have emerged. By and large they have been minimal and have consisted primarily of operation problems such as limiting access and implementing a *fair use* policy so all students have an opportunity to use the facilities.

The ELC is also home to a number of programs supporting first year transition into university. The ELC houses not only the First Year coordinator but also administration support and a roster of tutors (drawn from 3rd year engineering cohort) available between 9am and 3pm, five days a week. Students are encouraged to approach the tutors with any academic challenges in their work, although the tutors report they field questions ranging from mathematics to room locations. The ELC also hosts librarians twice a week, bringing the library to the students and some of the first year teaching team conduct consultation hours inside the centre. The space has been used to conduct workshops, provide group feed-back sessions outside of scheduled class time and student social activities after hours. It has also been used as a staff training and

conference venue outside of teaching weeks. The administration staff are available to field enquiries and to loan keyboards, mice and laptops for use within the centre. First year students have a resource-rich environment and assistance on hand, helping ease their way into academia.

Early data and perceptions

In 2007, 836 first year engineering students were surveyed, 763 responses were received. The students were asked a range of questions about the ELC. The preliminary analysis tells us that 93% of students agreed that the ELC design was suited to small group work with 70% of students reporting a positive group work experience. When looking at individual study, 27% agreed it was a suitable design for individual study with 42% of students reporting that the ELC was beneficial to their individual study experience. When asked if the ELC contributed to making new friends, 67% of students agreed that it did. Just over 50% of students took advantage of their peers by asking a stranger for assistance during the semester, of these 91% received the help they needed, peer-learning at its best!

In terms of usage, 10% of students used the space infrequently or not at all, with the remaining students somewhat evenly spread between “most weeks” and “most days” (see Figure 7). The mean number of hours estimated spent per week in the ELC was 4.8. These ranged between zero and 20+ (see Figure 8).

Figure 7

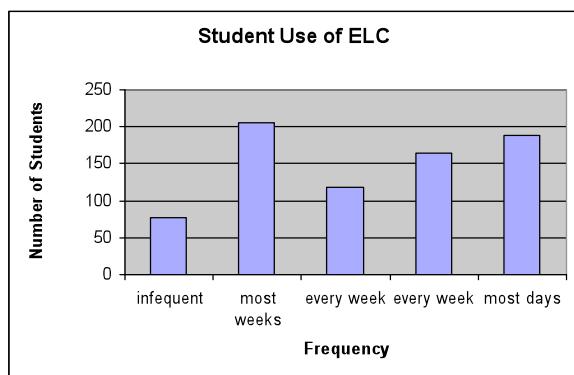
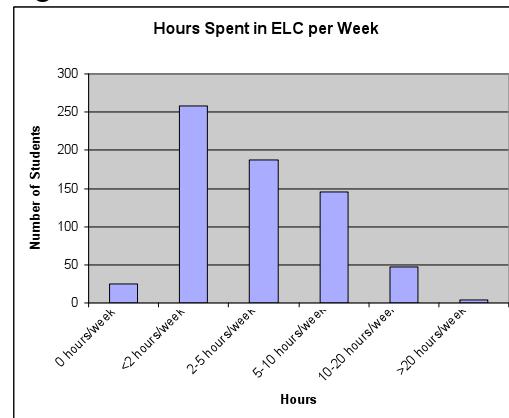
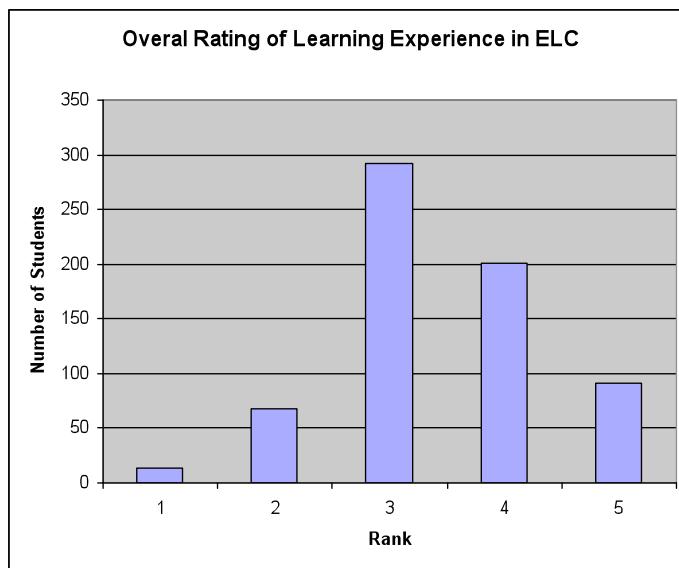


Figure 8



Students were asked to rate their overall learning experience in the ELC on a Likert scale from 1 to 5 where 1 indicated an awful experience and 5 an outstanding experience. The mean score obtained was 3.4 (refer to Figure 9 for the distribution of scores).

Figure 9



What do the students think about the centre? How is it any different to other spaces they might use for learning? The first year students contributed a number of course related journal entries throughout first semester, 2007. One of the journals asked the students to reflect on their use of the centre. There were approximately 700 responses and the following thematic analysis lends some insight into the student perspective. The students described both positive and negative aspects of the space. They raised issues about the physical environment, technology, milieu, and shared their thoughts on what they thought was important about the centre from a learning perspective.

The students overwhelmingly agreed that the centre was a noisy environment. This in itself makes it different to most other places that might be traditionally thought of as *learning spaces* such as a library or lecture theatre. Students were sharply divided in their opinions whether *noisy* was a good or bad attribute. As one student articulated, “the ELC is so loud most of the time... hard to concentrate on study”, which was rationalized by another student in the statement “as in the working world ‘Silent Learning Spaces’ are a luxury”. This is an interesting view point and an aspect of preparation for professional life that was not initially considered in the conception of the centre. Many other students felt that the noise levels were positive “I find the library too quiet”, “the ELC provides a less intense surrounding for those who find it hard to study in complete silence”, and “I think some people complain about the constant noise level in the ELC, I actually like it... it is much better than the awkward silence that is always present in the library”. It is worth noting that the original design for the centre contained a series of rooms each with a different purpose; the noisy and quieter zones were separated physically. This design was discarded largely due to budget constraints.

The physical environment of the centre surfaced as an important theme. The students commented that the centre was “easy on the eyes”. This was no doubt due to the “modern”, the “disturbingly creative furnishings”, the “colourful lighting” and the layout of the “comfy couches”. They also commented on the technical capabilities of the room and the human resources, which include the tutors and their peers, “at the ELC tutors are available and peers are usually willing to help you”.

While the physical environment is very important, it is those qualities of the environment that are less tangible that emerged as another obvious theme. Students remarked that the centre had a special atmosphere, that it is “dynamic”, “alive”, “positive”, “enthusiastic”, “vibrant”, and “fun” as well as “relaxing”, “homely”, “friendly”, “informal”, “inviting” and “creative”. They said it is “student-friendly” and that it encourages “laid-back learning”. This is in stark contrast to other comments like “distracting”, “crowded” and “more of a social area than an area of learning” suggesting that some students do not connect their learning with social discourse, “[they] use it to socialise and have fun. None of them actually get work done”; many of course do make this connection, for instance, “a relaxed and social place to discuss lessons” and “in the ELC we can feel free to discuss the problem with our classmates”. Some students even consider this a vital part of their education “there is opportunity to talk and confer in the ELC. Although quiet learning is important, I feel that team learning is even more vital to a rounded learning experience”.

A clear theme also emerged in which many students recognise the serendipitous nature of the centre, one in which the students have the shared experience of being first year engineers. The natural concentration of students in the one place lends itself to a unique learning experience, for example, “There is a lot more interaction with people who share the same courses and assignments as yourself. It is a lot more open and talkative, always discussions about all engineering courses” and, “everyone surrounding you is a first year engineer. It means that whenever you turn up there people know what assignments you are doing and they are willing to help”. Commonly, students mentioned that it was easy to approach colleagues they had not previously met. They felt comfortable asking for help. This scenario illustrates how the space can facilitate peer tutoring at its best.

Overall, students think the centre is extremely well suited to group work, commenting that the centre is *team-oriented, interactive* and *collaborative* in its nature; for instance, “the ELC is excellent for discussing work, having a group meeting in a relaxed and pleasant environment or catching up with other first year engineers” and “the more sociable environment of the ELC also means that it is more suited to teamwork with interactive team discussions being the norm in the centre”. The suitability for group work stems from a number of factors, the first of these being the large tables and booths which provide a favourable physical space for students to congregate. The second factor relates back to the noise issue. Students appreciate the ability to be able to speak to each other. The simple fact is that noise is allowed, enabling them to hold a *discussion without disturbing others*, is a significant benefit to the development of team based work. Students have the opportunity to connect with their peers in a *conversation-friendly* environment. They find the environment encourages them to brainstorm and that the “open and relaxed environment, where people who don’t even know each other can come together and work on common problems”.

The students also identified how the centre was useful to them in other ways. They were able to utilise the space for a quick *drop-in between classes* and for impromptu team meetings without having to book rooms, allowing for “several short meetings a week rather than one big one”. They also identified the longer visits as useful for study groups, socializing and team meetings.

Conclusion

The question remains, does the centre realize the objectives it set out to achieve? In terms of learning support to the first year students, there has clearly been a positive outcome within a relatively short space of time; for example, “[in the ELC there are] First Year Engineering students and tutors in the room so – ‘help is always available’” and “having people to study with and friends to check your work and help you understand things is an amazingly powerful learning tool”.

In terms of the overall first year experience for students, the ELC addresses a number of criteria. It provides a previously homeless cohort with a space to identify with as home; it enhances the virtual community established via online forums by providing a focus for real life interactions, it supports student collaboration within the project-centred curriculum and provides a vehicle to form connections and communities with peers and staff in their transition into academic life (Burnett, 2006; Tinto, 1999). The space, technologies and pedagogy are bound together by ENGG1000 and the transitions program. These form a scaffold for an integrated first year experience. One student stated, “you may in fact be supported, assisted and strengthen relationships – sort of like weight lifters spotting each other”. The centre also supports the establishment of early professional identity. For example, “at the ELC you can pull up a chair and gather in. You have a sense of identity by going in there, you feel like an engineer”.

The centre provides a space for first year students to congregate, to share ideas, help each other and socialise. It has a major impact on the first year experience by facilitating the development of learning communities, by promoting a sense of ownership over the space and thus the development of a sense of belonging in Engineering at UQ. Furthermore, it provides a space where social learning is encouraged and networks are fostered and developed. In a physical sense, the centre provides a place where student groups can come together to work collaboratively on shared projects or engage in peer tutoring and study groups. The students are engaged, enthusiastic and focused. Further research is planned to investigate why and how students utilize the space with these findings informing further investigation more widely applicable to other learning spaces.

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