What it is?

The First Year Engineering Learning Centre (FYELC) is a multi-purpose space located within the Engineering Precinct of the St Lucia campus of The University of Queensland. The plan to build this space was proposed in late 2004 with construction commencing late 2006. The FYELC was open for student use in March 2007.

The ELC consists of a large open-plan room divided into several zones, each of which serves a different purpose. The design employs furniture and lighting effects to create three distinct zones that support 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 centrally connected at the lectern situated towards the back of the space in front of a wall of whiteboards. The centre of the room contains a number of tables and benches. Electricity is supplied to these tables via floor ports allowing students to charge laptops, tablets, phones and personal digital assistants (PDA). The opposite side of the room is furnished with large couches and small circular café tables. The furnishings vary across the room from fixed to flexible configurations (Figure 1).

Beyond the wall of whiteboards, the centre also houses a smaller meeting room, kitchenette, reception area and administration office and is served by wireless Internet connection. The architects have not only made excellent use of natural light with the full length glass walls on each side of the room, but have also enhanced the environment by incorporating the use of coloured lighting. Appealing contrasts in colours, form and line are additional elements utilised to create a visually interesting space.

The FYELC is a congruent blend of formal and informal learning space. The lectern and projector have been used to deliver workshops and presentations at pre-arranged times. Ordinary, the centre operates on a drop-in basis and invites interaction between students. It is used very much as a meeting space for both studious pursuits and casual, social gatherings.

Why it is? – The principles behind the design

First year engineering at The University of Queensland is a broad program and not owned by any particular engineering discipline. While this allows time for students to sample the various strands of engineering and to gain an overall grounding in general engineering principles, there is a drawback. Students who are new to a university experience can feel overwhelmed and fail to develop a sense of “belonging” to their cohort. According to Krause et al. (2005), students are spending fewer hours on campus now than they did ten years ago. As this trend narrows the opportunities for social learning and limits formation of learning communities, it is important to place significant value on addressing the diminishing time students spend on campus. Owing to the nature of their program, the need for a separate space was identified among first year engineering students. This was addressed by providing a space on campus that they felt belonged to them and that they belonged to; a space where they could meet with their first year colleagues; a space tailored to the unique needs of students studying engineering.

The proposal for the FYELC was linked to priority areas identified within the University’s 2003-2007 Teaching and Learning Enhancement plan. During 2005 the proposal was submitted and approved by UQ Central Administration. Following approval of the initial concept (Figure 2), a project manager from UQ Property and Facilities was assigned to development. Wilson Architects tendered the architectural professional services component of the project, and submitted an initial design (Figure 3).
Typically, the first year engineering cohort consists of around 90 percent of school leavers (students under 21 years of age). Over 80 percent of first year students are male. The majority of the first year cohort is engaged in paid employment, many of them working more than 11 hours per week which is in line with current trends in Australia (Krause et al., 2005).

The main purpose of the FYELC 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 final design layout is shown in Figure 4. 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.

What happens here?

The FYELC is a technology-rich social learning environment that provides first year engineering students with a space to congregate, collaborate, socialise and identify with other first year engineering students. It is home to a number of programs supporting student transition into university life; an issue that many students are challenged by. In this particular setting the first year cohort size can be larger than the size of the student’s entire secondary school cohort. Environmental factors such as size and unfamiliar layout coupled with the process of forming acquaintances with staff and other students can be an overwhelming experience for a student. It is essential to foster a strong sense of belonging in students new to university as early in the new semester as possible (Tinto, 1999) to assist in easing the stressors of transition.

The FYELC provides a “walk-up” tutor support program. The centre is staffed by tutors between the hours of 9am and 3pm, five days a week.
These tutors are drawn generally from the third year engineering cohort. Students are encouraged to seek assistance from the tutors with academic challenges they are experiencing. The tutors are also often asked other “settling in” questions such as room locations in the early part of the first semester. The FYELC also hosts librarians twice a week during first semester, bringing the library experience to the students and assisting with research for group projects. Additionally, some of the first year teaching team hold their consultation times within the centre, bringing the academic staff into closer contact with the students. The administration staff is available to field enquiries and to loan keyboards, mice and laptops for use within the centre.

How is the space used?

One single learning space cannot hope to cater to all learning needs; at best it can strive to provide a balance of environments that suit the widest possible cross-section of students. By accommodating individual and group study areas and spaces to allow for some time out from concentrated study the FYELC aims to achieve this balance.

The design of the FYELC uses lighting and furniture to create three distinct environments to support a range of social and learning environments. There are three zones within the space – booths (Figure 1), and tables, benches and couches (Figure 5).

It was anticipated that students would use the booths to support their group project work and the central area for study groups and collaborative work. The booths are technology-rich zones where students usually engage in group-work either in teams or in study groups. There is some use of these facilities for social interaction. Students watch news, current affairs, cartoons and sport on the HD TV screens, play DVD movies and occasionally use games consoles. The tables and benches in the centre of the room are utilised for both individual and group academic work. This space is also popular for card games.

The soft furnishings in the couch area are used gathering for discussions over coffee. While the booths and central table zones are being utilised much as anticipated, it is interesting to note that the couch zone has not been used as expected. Far from the relaxed social space envisaged in the design brief, observations of student use indicate that the predominant use of this space is for group and individual study. Students cluster around the small tables in groups of up to five filling the table with laptops and books. Students are still engaging socially however, predominantly around their learning activities rather than over a coffee or soft drink. Figure 6 shows typical use of the centre and couch zones. The space has also been used to conduct workshops, provide group feedback on assessment outside of scheduled class time and host student social activities.

The FYELC is a bustling, energetic and noisy environment. The students who occupy its walls demonstrate a sense of ownership over “their” space. The students who use this centre appear protective of the resources contained within. Vandalism has not been a dominant issue, nor is littering, although we have learned some lessons about handling waste.
How is technology used?

Each of the three zones within the main space of the FYELC has differing levels of technology and would, by nature, lend themselves to different uses. Wireless coverage is available throughout the centre (and across significant areas of the University). The option for students to use wireless connection to the University servers and the Internet has seen a steady increase in the usage of this facility, to the point of saturation. The University is now addressing the phenomenal increase in wireless use to provide better and seamless service to all staff and students.

The booth zone boasts a console containing a DVD, VCR, 40" flat-screen with digital TV and PC connected to the university network. While students do socialise and watch various media in the booth zone, the students are predominantly engaged in individual or group study. When students are not using the flat screens to collaborate they use the television to provide background noise, much as they would at home. Students utilise a combination of their own laptops, laptops on loan from the FYELC and the built-in PCs within the booths. The AMX system is used to operate the controls of individual booths. Students use this regularly, and are seen to “experiment” with the central controller at the lectern to operate the lights and data projector and screen. Students rarely use these features at the lectern in an operational sense, more out of curiosity.

The central zone (tables and benches) is utilised as expected for both individual and group work. Power points are built into each table and bench. These are routinely used for powering laptops which students use to support both individual and group study. While laptops are available for loan from reception, many students use their own.

In the couch zone no technology is provided other than the wireless network and the loan laptops. Despite the lack of power or inbuilt technology within this zone, students regularly work in groups, clustered around a laptop. Students use this space in a way they might use their homes also, with friends visiting for a study group.

How does pedagogy influence the use of the space?

As outlined in the original proposal, the FYELC space aligned with social constructivism and was developed to improve the first year learning experience through:

1) Fostering a sense of belonging and identity
2) Providing collaborative learning and networking opportunities and
3) Providing a home for physical and virtual resources essential to supporting the transition to and implementation of high quality teaching and learning in first year engineering.

Engineering at The University of Queensland commences with a common first year program. During this year students are encouraged to choose a discipline area. The FYELC is designed to embrace the interdisciplinary and collaborative nature of modern engineering (Steer, 2008). During the common first year, students are introduced to project-based learning through the flagstone course “Introduction to Professional Engineering”. Students undertake a major team-based design project in their first semester. The nature of small group-based assessment drives the way the centre is used during this first semester. Students identify the room as “somewhere to belong to”. Additionally, it provides students with a place to congregate between formal classes. Referring again to The First Year Experience study by Krauss et al. (2005), mention is made of the decreasing number of hours spent on campus over the past decade. The FYELC is a valuable tool to encourage students to stay on campus and engage with other members of their cohort outside of formalised teaching times.
Students themselves make meaning of their studies through exploration of concepts in a social context. The FYELC takes advantage of this social constructivism (Vygotsky, 1978) by furnishing the space with a continuous round of interactive models for students studying “static mechanics” to experiment and play with to enhance their understanding of the principles behind statics. The students themselves become the makers of meaning outside the formal classroom setting (Figure 7).

A report compiled for the Scottish Funding Council (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”.

**Fitting Space, Technology and Pedagogy together**

The nexus between technology-space-pedagogy in first year engineering learning strives to produce capabilities in graduate attributes by “enriching the first year experience by providing collaborative learning and networking opportunities and nurturing a sense of belonging and identity” (Steer, 2008). The capabilities of the centre are enhanced by the availability of tutors and the co-location of the first year coordinator.

The FYELC utilises technology and its use is driven by the pedagogy of the first year curriculum. The technology is used to create virtual learning spaces to be used in conjunction with the FYELC as well as supporting the pedagogy of the first year curriculum. In the model (Figure 8), each axis supports the other and is grounded in both the flagstone course and the extracurricular transition program.

How was the facility evaluated?

As can be seen in Figure 8, evaluation cannot be taken out of context; pedagogy drives use of the physical and virtual learning spaces, both of which are technology-rich. There are multiple aspects that can be examined: the relationship of space to students, both as individuals and within groups, the pedagogy of first year engineering courses, aspects of curriculum and the teaching staff. There is a lot of money being invested in building spaces in Australian universities (NGLS, 2007), a fact which can be applied internationally: universities around the world are devoting time and money to provide cutting edge facilities for their students.

The biggest question is not so much about how to assess impact, but more importantly “what is it that we want to assess”? Given the nature of this particular space as less of a classroom and more of a common room, looking at direct measures of classroom learning and teaching is complex and makes meaningful interpretation problematic. However, in employing literature on that which defines effective learning, broader measures become more applicable. Chickering & Gamson (1987) composed their “seven principles of good practice” some decades ago. These principles are still widely referred to, providing a useful place to begin. They suggest the following:

- Frequent student-faculty interaction
- Cooperation among students
- Provide opportunities for active learning
- Ensure prompt feedback
- Emphasize time on task
- Communication of high expectations
- Respect for the diverse talents & ways of learning of the students

In more recent research Kuh, Pace and Vesper (1997) and Norwani (2005) suggest that only two of the above factors make a significant difference,
Taking this into account, the impact of the space on students was assessed by examining the activities for which the students were using the space, the length of time and frequency the space was used and student perceptions of the space itself.

Research has revealed that 93 percent of students agree that the FYELC design is suited to small group work with 71 percent of students reporting a positive group work experience (Steer, 2008). 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 FYELC 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 FYELC also means that it is more suited to teamwork with interactive team discussions being the norm in the centre”. Students have the opportunity to connect with their peers in a conversation-friendly environment. They find the environment encourages them to brainstorm and to work on common problems. When looking at individual study, 27 percent of students agreed it was a suitable design for individual study with 43 percent of students responding very positively with only 12 percent stating that they did not use the space. More than a quarter of the students used the learning space on most days with the mean number of hours spent per week in the FYELC estimated at 4.8. Overall, 60 percent of students used the learning space more than two hours per week and 22 percent used it for between 5 and 10 hours per week Table 2.

There has been a positive outcome in terms of learning support with students commenting “[in the FYELC 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”. When asked to rate their overall learning experience in the FYELC, students responded very positively with only 12 percent considering the space not good for their learning. Table 3. Students recognise the value in being surrounded by their peers as one student stated, “you may in fact be supported, assisted and strengthen relationships – sort of like weight lifters spotting each other”. The students described both positive and negative aspects of the space. They agreed that the centre was a noisy environment. This in itself makes it different to most other traditional learning spaces such as a library or lecture theatre. Students were sharply divided in their opinions whether noisy was a positive or negative attribute. Opinions such as “The ELC is so loud most of the time… hard to concentrate on study” were juxtaposed with “as in the working world ‘Silent Learning Spaces’ are a luxury”. Many students felt that the noise levels were positive, with students commenting “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”.

The physical environment of the centre surfaced as an important theme as well. Architecturally the students commented that the centre was “easy on the eyes”. They mentioned the distinctive furnishings, the colourful lighting, couches and the overall layout of the learning space. They also commented on the technical capabilities of the room and the human resources, which include the tutors and their peers, all of which contributed to the overall physical environment. While this is very important, there are also environmental qualities which are less tangible, but no less important. Students remarked that the centre had a special atmosphere, that it is “dynamic”, “alive”, “positive”, “enthusiastic”, “vibrant”, and “fun” as well as “relaxing”, “homey”, “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”, with suggestions that some students do not connect their learning with social discourse such as “[they] use it to socialise and have fun. None of them actually get work done”. Many, of course, do make this connection, for instance, and commented that the space was “a relaxed and social place to discuss lessons” and “in the FYELC 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 FYELC. Although quiet learning is important, I feel that team learning is even more vital to a rounded learning experience.”
What were the main lessons learned?

1. The use of casual space 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 five 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 (Figures 5 & 6) demonstrating the essence of social learning. One student described the centre as a space where “learning happens through interaction”. As a result, the original low coffee tables were ignored in favour of the small round café-style tables. Low coffee tables were relocated and more café-style tables and stools were added.

2. Another significant surprise has been the amount of time students spend in the space every week. This was not anticipated. The furniture was not selected with this kind of use in mind. As furniture is replaced, these issues will be considered.

3. Students need for electricity recharge should not be underestimated. There are now plans for more electronic outlets to be added to the FYELC.

4. Students use the kitchen area as a study zone – if there is space to be occupied, students will use it. This can make things awkward when the kitchen is being used to prepare food.

5. Initial inclusion of chilled drinking water and hot water tap in the planning stages should be addressed, as retrofitting is expensive.

6. No matter how tidy students are, there is a waste stream. Planning for efficient waste disposal is important and should not be an afterthought.

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