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Introduction

The Next Generation Learning Spaces project (NGLS) focuses on the activities taking place in learning spaces within higher education institutions. A major contribution of the NGLS research is the creation of a coherent and comprehensive framework for guiding the design and implementation of new learning spaces. This research is at the leading edge of enhancing learning environments and outcomes in higher education.

The Pedagogy–Space–Technology (PST) framework was developed, rigorously tested, and thoroughly evaluated before being disseminated widely through two national colloquia. The framework, developed through a collaborative process, acknowledges the needs of different academic disciplines, and was pioneered at the University of Queensland.

Three distinct types of learning environments were designed, demonstrated, and evaluated using the unified approach made possible by the framework; Next Generation Libraries (connected learning experiences beyond information), Collaborative Learning Centres (challenging our assumptions and pushing the boundaries), and the Advanced Concept Teaching Spaces (the interactive lecture theatre of the future). These spaces embody new learning modes, innovative uses of space, and emerging popular technology. They are exemplars at the very cutting edge of worldwide learning practice.

The Pedagogy-Space-Technology framework provides a robust basis from which to develop design briefs, assess alternative concepts, and evaluate learning environments. Its format enables concepts for learning spaces to be replicated and applied in various contexts around the country, and beyond.

The detailed case studies in this publication were presented at the NGLS 2008 Colloquium, and focus on the successes and obstacles in designing next generation learning spaces. The case studies illustrate the importance of the PST framework in the operation and evaluation of new learning spaces.

The information provided in the following chapters and case studies is the result of research and testing new ideas in learning spaces. The outcomes have significantly improved the learning experience for students and have also informed pedagogical and technological approaches to teaching in the university environment.

The following people brought their expertise to the NGLS project. Professor David Radcliffe has a sustained history of teaching and learning innovation, research and scholarship in engineering education and learning centre design. Hamilton Wilson is the Managing Director of Wilson Architects. As a working architect he has extensive experience of delivering major projects to a variety of clients but especially in the higher education sector. Wilson Architects are focused on the design of university libraries and learning environments, and Hamilton is particularly interested in creating design solutions that help meet student diversity in study behaviour. Derek Powell brings a broad perspective to the application of technology to learning spaces. He conceived the Advanced Concept Teaching Space initiative and directed the technology research and development used in this space.

Belinda Tibbetts
University of Queensland
Over the past decade there has been a growing body of knowledge and working examples of new approaches to the design of learning spaces in higher education institutions. Despite this, a clear consensus is yet to emerge. A number of factors are driving innovation and experimentation in the design of learning spaces in North America, Europe and Australia. These include changing social patterns, generational change, a changing funding environment, new and emerging technology and the shift to a more learner-centred pedagogy.

There has been a tendency for many initiatives in learning spaces to be technology-driven (Long 2005; Valenti 2002) or to a lesser extent pedagogy-driven. On occasions both technology and pedagogy are considered in tandem (Brown 2005; JISC). Somewhat differently, Jamieson et al. (2000) examines the pedagogy-place nexus. Where pedagogy is a focus, these initiatives adopt some explicit form of learner-centred or constructivist pedagogy paradigm (Brown 2005; Oblinger 2005).

Moore and co workers (2006) observe that as a response to the different approaches to learning and sensibilities of the next generation, “some faculty have changed teaching strategies simply to recapture the attention of students who are net-surfing, instant-messaging, and text-messaging during scheduled meetings”. They go on to argue that “creating learning environments that challenge students to become actively engaged, independent, lifelong learners inside and outside of formal learning spaces should be the critical aim of change in teaching strategies”.

In reality there is a nexus between pedagogy, technology and the design of the learning space. There are real and virtual dimensions to each of these and this nexus is now being recognised and discussed. For example a recent paper by Oblinger (2005) concludes that “the convergence of technology, pedagogy and space can lead to exciting models of campus interactions.”

This paper presents the Pedagogy-Space-Technology (PST) Framework for guiding the design of learning spaces which takes account of these three factors in informing the conceptual design and post-occupancy evaluation of either discrete learning environments (e.g. individual rooms) or networks of places (e.g. a whole campus).

Innovative Learning Spaces

In the United States of America there are several collaborative initiatives, consortia and consultancy groups active in developing innovative learning environments, including:

- The National Learning Infrastructure Initiative (NLI), sponsored by Educause, and their Learning Space Design Constitutive Group
- Student-Centered Activities for Large Enrolment Undergraduate Programs (SCALE-UP) at North Carolina State University to develop a highly collaborative, hands-on, computer-rich, interactive learning environment for large enrolment courses.
- The Kaleidoscope Project which is focused on developing learning environments that support undergraduate study in science, technology, engineering and mathematics (STEM).
- The Teaching Learning and Technology (TLT) Group

There are an increasing number of exemplars of next generation learning spaces, often associated with the various consortia listed above. Some like the Technology Enabled Active Learning (TEAL) project at Massachusetts Institute of Technology (MIT) (Long 2005) and the Learning in a Technology-Rich Environment (LITRE) at North Carolina State University have a particular focus on technology.

Others, like Wallenberg Hall at Stanford University, combine technology with a flexible architecture and mobile fittings. The Stanford Centre for Innovations in Learning, responsible for Wallenberg Hall, focuses on people, places and processes, although there is also a strong theme of advanced technology, especially web-based tools.

The history of the Integrated Learning Centre at the University of Arizona highlights the importance of having the right people involved at each stage in the development of new learning spaces. At the inception the visionary and the key (political) allies are the key drivers. During the conceptual design the “grounded dreamers” need to be brought on board and should be drawn from students, staff, teaching consultants, instructional technology specialists, facilities designers and Information Technology specialists. They argue that the planners including the architect and the project manager only need join by the time of detailed design; although this is contestable. By the time of construction the builders, contractors and sub-contractors have joined the team. In the early years of occupation all the people involved to this stage should be the promoters of the initiative.

The Integrated Learning Centre (ILC) in the Faculty of Applied Sciences at Queen’s University, in Kingston, Ontario (Canada) was conceived with several purposes in mind. These included having a learning environment that supported a major piece of curriculum reform based on a shift to a more active and project-based approach. They also sought to use the building itself as a learning tool and encouraged integration of academic staff from different departments through a common, overlapping space at the intersection of several
The report “Designing Spaces for Effective Learning, guide for the 21st century learning design” (JISC) explores the relationship between learning technologies and innovative examples of physical space design. There are several examples that are of particular relevance to this project. The InterActive Classroom built in 1998 in Mechanical Engineering at Strathclyde University, Glasgow, Scotland relates to the ACTS (Advanced Concept Teaching Space) concept proposed here. Intended to encourage more student interaction via a Socratic dialogue method, the room has relatively conventional facilities with slightly curved desk tops plus the addition of a polling system – the Personal Response System. In 2000 the University built the first of its new Teaching Clusters to encourage collaborative learning. There is little detail on these clusters, they encourage experimentation and innovation, tracking results and sharing these with colleagues.

The project has engaged a large number of people representing a diverse range of stakeholders; learners, teachers, learning support staff, administrators and design and technology professionals at the University and nationally. This agrees with the recommendation of Oblinger (2005) that the following groups should be “at the table” when designing new learning spaces: Administration, Faculty, Students (undergraduate and postgraduate), Facilities, Planning, Information Technology, Library and Teaching and Learning Support.

A key feature of the project’s engagement and dissemination has been a series of national forums on Next Generation Learning Spaces, the first of which was held in July 2007. This event provided an opportunity for the diverse stakeholder group to experience the new learning spaces at the University of Queensland. Various sessions were held in the new spaces with forum delegates undertaking interactive exercises designed to demonstrate the features of the different spaces. The first forum also provided an opportunity for other universities to showcase the learning space they were most proud of.

Next Generation Learning Spaces (NGLS) Project

In 2006, the Carrick Institute for Teaching and Learning in Higher Education in Australia funded a national project called Next Generation Learning Spaces. This project is focused on what happens in learning spaces and seeks to create a coherent and comprehensive framework for guiding the design and operation of new learning spaces. The primary goal is to fully develop, rigorously test in the field, thoroughly evaluate and disseminate widely a new design framework. It will be in a form that allows the concepts to be generalised and replicated in new and different applications, nationally and internationally. This new framework has been developed through a collaborative, interdisciplinary and participatory process, drawing on knowledge from all the stakeholder groups.

The scope of the project includes the design, demonstration and evaluation of three distinct types of learning environments using this unified approach that have been pioneered at the University of Queensland. The three space types are: next generation libraries (connected learning experiences beyond information), collaborative learning centres (challenging our assumptions and pushing the boundaries) and advanced concept teaching spaces (the interactive lecture theatre of the future). While there is some knowledge and experience on the use of these new forms of learning space there is still much to discover.

The Saltire Centre at Glasgow Caledonian University is highlighted. It is a large informal space that provides a hub – “the social heart” for the university; it physically connects different parts of the campus and also provides wireless connectivity. It has social and civic spaces and glazed atrium that provides natural lighting and ventilation as well as an exhibition space. The Centre incorporates a student services mall and a learning cafe. The upper floors contain the library facilities in relatively informal layout with some formal seminar rooms (Saltire 2006).

The JISC (Joint Information Systems Committee) report provides some general advice on the design of learning centres and a generic floor plan but very little by way of specific examples.
As well there is little or no empirical evidence objective data based on well-documented case experience. However there is really very little objective data based on well-documented case studies or analysis that can be used to test these. As well there is little or no empirical evidence provided to support the proposed principles.

The JISC report argues that “a learning space should be able to motivate learners and promote learning as an activity; support collaborative, as well as formal, practice; provide a personalised and inclusive environment; and be flexible in the face of changing needs”. It states that the design of individual spaces within an educational building needs to be:

- Flexible – to accommodate current and evolving pedagogies;
- Future proofed – to enable space to be re-allocated and reconfigured;
- Bold – to look beyond tried and tested technologies and pedagogies;
- Creative – to energise and inspire learners and tutors;
- Supportive – to develop the potential of all learners; and
- Enterprising – to make each space capable of supporting different purposes.

Oblinger (2005) takes a more focused and learner-centred approach to the design of facilities:

- Design learning spaces around people
- Support multiple types of learning activities
- Enable connections, inside and outside
- Accommodate information technology
- Design for comfort, safety and functionality
- Reflect institutional values

Jamieson et al. (2005) promote the adoption of multi-disciplinary approaches and the use of participatory design processes and offer the seven guiding principles to be used for “augmenting rather than replace in toto existing design principles” as follows:

- Design space for multiple use concurrently and consecutively
- Design to maximise the inherent flexibility within each space

- Design to make use of the vertical dimension of facilities
- Design to integrate previously discrete campus functions
- Design features and functions to maximise teacher and student control
- Design to maximise alignment of different curricula activities
- Design to maximise student access to and use/ownership of the learning environment

Design Principles for Learning Spaces

A number of authors have proposed lists of design principles or similar as guides in the creation of contemporary learning spaces. There is no generally agreed approach to the creation of new learning spaces and various groups are promoting particular sets of guiding principles for the creation of such spaces. Some of these lists of principles are aspirational while others imply they are based on experience. However there is really very little objective data based on well-documented case studies or analysis that can be used to test these. As well there is little or no empirical evidence provided to support the proposed principles.

The major transferable outcome of the project will be the new design framework based on the pedagogy-space-technology nexus. This framework will provide a robust basis for developing design briefs, for assessing alternative concepts and for evaluating new learning environments. It will be in a form that allows the concepts to be generalised and replicated in new and different applications. The project is developing detailed case studies that get into the ‘nitty gritty’ of what really works and what does not, based on the development and evaluation of these new spaces and their predecessors. These case studies will illustrate the operation of the new design framework.

Design Principles for Learning Spaces

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These reflect concepts in classic works like Chickering and Gamson’s “Seven Principles” (1987) or the more recent NRC (National Research Council) report on “How People Learn” (2000). It is recommended that the design team works from the desired learning principles to define a set of learning activities that will promote these principles. The design principles flow from learning principles and the learning activities. Thus there is not a single universal set of design principles but a particular set that meet the needs of a given project. It is only after the design principles are established that the requirements for the particular setting are derived. Johnson and Lomas go on to emphasise the importance of considering how to measure success in the design of new learning environments.

Taking yet another tack, Long and Ehrmann (2005) suggest four ideas that are useful in imagining the classroom of the future; Learning by Doing Matters; Context Matters; Interaction Matters and Location of Learning Matters. They proceed to list the characteristics of the “classroom of the future” as:

- Designed for people, not for ephemeral technologies
- Optimised for certain learning activities; not just stuffed with technology
- Enabling technologies brought into the space, rather than built into the space
- Allowing invisible technology and flexible use
- Emphasising soft spaces
- Useful across the 24hr day
- Zoned for sound and activity

While these various lists offer general design principles for guidance, they are difficult to apply in practice with a multi-disciplinary team of stakeholders in the creation of new learning spaces. The style of the pithy taglines is rather high-minded and universal and thus ambiguous; attractive to ‘big-picture’ thinkers but not so to stakeholders concerned about the specifics.

**Proposed Pedagogy-Space-Technology (PST) Design & Evaluation Framework**

Based on the preliminary findings from the NGLS Project, we propose the following question-based framework to aid diverse stakeholders to approach the creation, operation and evaluation of new learning spaces. The framework invites stakeholders including administrators, faculty, architects, students, equipment and technology providers at each stage of the conception, development, realization and use of a new learning space to reflect on what they are doing and why. It is inherently self-documenting and aids the elicitation of lessons learned for future projects.

In recognition that each of these stakeholder groups has a particular set of background assumptions, expectations and practices about how they should or could contribute to the realization of a new learning space project, the framework is not in the form of a prescriptive model of the design or delivery process per se. A model-based approach would tend to privilege those who were familiar with that particular form of representation, depending on what type of model was used or how it was presented visually. For instance if the framework were constructed around a model of the design and delivery process familiar to architects, this might not mean very much to a faculty member from the liberal arts who is trying to evoke a particular learning experience or an administrator who is focused on project management issues like cost and risk. By using a series of generic trigger questions all stakeholders potentially have equal access to the design conversation.

One reason for keeping the framework simple was to enable it to be used in a wide range of project types and scales and institutional contexts. An objective of the NGLS is to try to get comparative data from many different projects across the country, both current and completed, so that it is possible to identify patterns in what different institutions are trying to achieve, how they do this and how they evaluate success. Obviously additional and more detailed questions can be added in each section and at each stage as fitting the particular instance.

The sequencing of the items in the framework is intentional and important. Each of the three elements, pedagogy, space and technology, influence each other in a reciprocal fashion. Thus achieving a desired pedagogy might suggest a preferred way to arrange the shape and use of space, equally a learning space irrespective of its intended use will tend to shape what people do in it and hence the patterns of teaching and learning. Similarly a particular space places constraints (or presents opportunities) for the introduction of certain type of technology while a given technology can impact how a space is used by teachers and students. Thus while all three are interdependent in a cyclical manner, the question remains; which element do you start with? Pedagogy seems to be the logical first element, then space and finally technology.

However this is not to suggest a hierarchy or to value pedagogy more than space or technology. Rather it is a recommended place to enter the pedagogy-space-technology loop in order to go through an iterative process. Ideally such iteration would occur several times at each stage of the life-cycle of a learning space (cradle to cradle). While only two life-cycle stages are represented in the Table 1 (as the columns - Conception & Design and Implementation & Operation), the framework could be made more fine-grained by splitting these into more than two columns corresponding to more life-cycle stages and writing appropriate questions to each stage. Thus if a particular institution has a prescribed set of project stages with decision points (stage gates), then the basic PST framework questions can be re-written to suit the declared delivery steps or stages for the institution; it can be tailored to meet particular ways of doing work.
### Table 1 - Pedagogy-Space-Technology (PST) Design & Evaluation Framework

#### Life-Cycle Stage

<table>
<thead>
<tr>
<th>Focus</th>
<th>Conception and Design</th>
<th>Implementation and Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td>What is the motivation for the initiative?</td>
<td>What does success look like?</td>
</tr>
<tr>
<td></td>
<td>What is intended? What initiated the project? Who are the proponents and opponents? Who has to be persuaded about the idea? Why? What lessons were learned for the future?</td>
<td>Is the facility considered to be a success? By whom? Why? What is the evidence? Does this relate to the original motivation or intent? What lessons were learned for the future?</td>
</tr>
<tr>
<td><strong>Pedagogy</strong></td>
<td>What type(s) of learning and teaching are we trying to foster? Why?</td>
<td>What type(s) of learning and teaching are observed to take place? What is the evidence?</td>
</tr>
<tr>
<td></td>
<td>Why is this likely to make a difference to learning? What is the theory &amp; evidence?</td>
<td>What evaluation methodology or approach was used and what methods were used to gather and analyse data?</td>
</tr>
<tr>
<td></td>
<td>What plans will be made to modify programs or courses to take advantage of the new facilities?</td>
<td>Who was included in the data gathering and analysis? Students? Faculty? Staff? Administrator? Senior Leadership? Facilities managers and technology staff?</td>
</tr>
<tr>
<td></td>
<td>What education or training for academics and other staff is built into the plan?</td>
<td></td>
</tr>
<tr>
<td><strong>Space</strong> (including environs; furniture and fittings)</td>
<td>What aspects of the design of the space and provisioning of furniture and fittings will foster these modes of learning (and teaching)? How?</td>
<td>Which aspects of the space design and equipment worked and which did not? Why?</td>
</tr>
<tr>
<td></td>
<td>Who is involved in developing the design brief? Why?</td>
<td>What were the unexpected (unintended) uses of the space and facilities that aided learning or facilitated teaching? Do these present ideas for future projects?</td>
</tr>
<tr>
<td></td>
<td>Which existing facilities will be considered in developing concepts? Can we prototype ideas?</td>
<td>How was the effectiveness of the use of space to aid learning and teaching measured? What were the different metrics used?</td>
</tr>
<tr>
<td></td>
<td>Who is involved in the assessment of concepts and detailed design? Why? What are their primary issues and concerns?</td>
<td>Where there synergies between this and other spaces that enhanced learning?</td>
</tr>
<tr>
<td><strong>Technology</strong> (ICT; lab and specialist equipment)</td>
<td>What technology will be deployed to complement the space design in fostering the desired learning and teaching patterns? How?</td>
<td>What technologies were most effective at enhancing learning and teaching? Why?</td>
</tr>
<tr>
<td></td>
<td>In establishing the brief and developing concepts and detailed designs, what is the relationship between the design of the space and the selection and integration of technology?</td>
<td>What were the unexpected (unintended) impacts (positive and negative) of the technology on learning and teaching?</td>
</tr>
<tr>
<td></td>
<td>What pedagogical improvements are suggested by the technology?</td>
<td>How did technology enhance the continuum of learning and teaching across the campus and beyond?</td>
</tr>
</tbody>
</table>
A Pedagogy-Space-Technology (PST) Framework for Designing and Evaluating Learning Places

References


JISC Designing Spaces for Effective Learning, guide for the 21st century learning design.


The Process of Creating Learning Space (H. Wilson)
There seems to be a significant disconnect between those who teach in spaces, those who design learning spaces, and those who incorporate technology into these spaces. We can see this disconnection in terms of the language and understanding of how different groups describe space: the word ‘collaboration’ may mean subtly different things to a teacher, architect, or technologist.

Subsequently we find an inconsistency in quality, cost and outcomes of designing learning spaces. Finding a way to navigate through the current pedagogy/space/technology paradigm has been a particular focus of our study.

The model for designing and building learning spaces has not changed dramatically for over one hundred years. More recently we find significant shifts in pedagogy and at the same time a desire to incorporate technology, whilst still using the same industrial systems of space delivery. In this climate of change new spaces are being developed as potential prototypes for ‘the new’. The danger lies in a lack of understanding about how these spaces are designed and are evaluated in that they are often copied out of their context and without any regard for how that space may have related to the particular pedagogy it was designed for, or whether the technology was appropriately assigned.

The process of procuring learning space relies on many players in order to bring any of these projects to fruition. The game however has had its ground shift. We can no longer rely on the standards for learning spaces developed over time since the 60s and 70s. Learning space was distilled into an efficient set of design standards useful for facilities managers and architects. Academics based their funding bids on them. They were extremely successful models for didactic teaching models with limited technology. The new age of learning is much more dynamic and more technologically-rich.

With the obvious need to re-examine the way we design, we find we also need to revisit the whole procurement process. It is not that there are not exemplars, but that there is a consistent inconsistency in their outcomes.

These are the following themes that were raised in the final colloquium session that we can begin to unpack through lessons learned over the two years.

**The space bid** - The process of the academic presenting a case to gain funding.

**The funding bid** - The process to filter and prioritise which projects from the pool of space bids should get up. How each project can contribute to the campus framework and connected learning experience.

**The design phase** - The process of understanding the intersection of pedagogy, space and technology and the implications to the enabling of learning.

**The construction phase** - The process of building and the co-ordination of key stakeholders to ensure a quality outcome.

**The space bid**

What is the format for Academics presenting a case for new space?

The politics of space mean that quite often the projects are developed within Faculties and have
The Process of Creating Learning Space

The funding bid

To begin to develop a framework that strategically places proposed or refurbished space bids in context within the campus can help evaluate diverse projects more objectively. By looking at the campus as a connected learning experience it is possible to strategically understand the balance and mix of learning space. A new model called the Places for Learning Spectrum begins to consider this continuum and develops a dialogue to discuss any space on campus (Figure 2).

Campuses need to be contemplated as a complete network of connected learning environments. In this framework the process of learning does not exist singularly but rather it happens within a range of different types of pedagogies, spaces and technologies. This learning space continuum has two types of conditions at its extremities. Wholly independent self-directed unstructured learning at one end and structured teacher-led didactic learning environments at the other. Within this range a spectrum of other pedagogies, spaces and technologies provide an effective learning framework.

This model looks at an institution as a whole and rather than it being made up of a series of learning silos we consider space as a highly connected network of places for learning. This model proposes that every square metre has the potential to support the learning process and so every coffee shop, every corridor, every courtyard is incorporated into the design.

The Places for Learning Spectrum is student-centric and can be broken down into three components exploring these relationships from their perspective:

- The types of physical spaces to support learning;
- The various communities of people who support learning (staff, peers, community);
- Learning modalities to enable learning for different student outcomes.

Every space that can be conceived within and beyond the campus can be mapped and a dialogue begun about learning potential.

Their own advocates to push projects through for funding approval. The bids are often prepared by people who may be preparing a submission for the first time. The inconsistency of this process is open for examination. Almost all of the spaces identified with the case studies were exceptions to this rule in that they were identified as strategic innovation projects and often fell outside the normal bidding process. Interestingly, the dominant players in the innovation of space were within the library.

Within the colloquium’s interactive session it was discussed that there may be an opening for a new type of person who has an understanding in Pedagogy/Space/Technology (a type of educationalist dramaturge - a theatrical position where their contribution is to assist the director to categorise and discuss the various types and kinds of plays, their interconnectedness and their styles).

This PST Dramaturge would be able to assist the faculty in articulating their teaching and learning outcomes to align with space (the amount of space required for any particular cohort size) and extent of technology support. This kind of support to faculties could give more weight to their space bid and a consistency in their evaluation.

This method was utilised with the development of the briefs for the Australian Defence Force Academy’s refurbished learning spaces (2008). In this case the staff were required to apply the Pedagogy Space Technology metric in their consideration. For each space a descriptor for the learning outcomes and teaching modality was articulated. Space recognised the size and makeup of the cohort. The Technology component focused on what technology would best enable the pedagogy and support the students. This process was in the whole, successful in that it examined a diverse range of teacher-led spaces as well as social learning spaces. This process still relies on the briefing group having a deep understanding of how to articulate the various components. A PST dramaturge would have been able to sit down with them to work through these areas in more detail. This is in effect what happened when it was redrafted and reissued.

The funding bid

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Every space that can be conceived within and beyond the campus can be mapped and a dialogue begun about learning potential.

The funding bid
A student who enrols in a university to gain an expertise in a particular field of study is, by default, a member of their faculty community. Many universities undervalue this group through poor visibility of their study cohort and limited opportunities to interact and to support each other. At the entries to faculties more space needs to be given over to describing the place of learning, reinforcing the type of learning that happens there and spaces to support students to be able to study with their own cohort. It is interesting to note how many universities have the ground floor of a faculty significantly occupied by staff and the students are to be found elsewhere.

Peer to peer learning spaces enable this level of engagement if located at entry levels and when the space is highly visible. This type of space can be clearly seen and understood with the new First Year Engineering Learning Centre at the University of Queensland (Figures 4 & 11). The client brief was for a critical space for students to support their intensive project-based curriculum. The outcome was a highly active learning place where the first year students are given the opportunity to own their space, support each other, and be in a common location for lecturer support. The opportunity for students to be supported by other students who have the same learning challenges results in two unique outcomes. The student feels they belong to a community and are supported by it.

The Places for Learning Spectrum begins to also focus on the types of generic teaching and learning spaces that can better enable learning. Traditionally lecture theatres were the only type of large structured teacher-led space. Now it is generally acknowledged that, with a shift to more project-based learning, a broader range of spaces with a range of technology support needs to be available. Collaborative teaching and learning spaces and Active Learning Spaces (Collaborative teaching and learning spaces and Active Learning Spaces)

With the advent of more project-based learning there is an obvious need for libraries to support more group work, but spaces associated with coffee shops and social places also enable a dynamic environment for study. Although supporting a more diverse study cohort these are spaces that can begin to establish better interdisciplinary networks.

The framework lets us begin a more meaningful dialogue about any place within a campus and where pedagogy and the community it serves can be considered.

The design phase

Learning places may be broken down into two distinct types: structured (teacher-led) and unstructured learning (peer to peer, social learning and self directed). Within this simplistic framework all places for learning can be conceived. This model looks at an institution as a whole rather than a series of independent faculties, and instead looks at space as highly connected network of places for learning.

Structured Learning Environments

Within any one teacher-led learning experience there are generally a number of modes that can be identified.

- Didactic mode: set scene for investigation / delivery of content / instructional
- Collaboration mode: investigating as group
- Feedback mode: discussing group outcomes
- Reflective mode: documenting (individual or group) - assignment/project write up

Within any learning session the space and technology needs to support the dominant learning mode. If the pedagogy is predominantly collaborative then it is counterproductive to the learning experience to have a room full of tables in rows, with very little room to move around furniture. A simple test is to document the proportion of learning modality, ie if the pedagogy is project based/collaborative then the pedagogical weighting may be as follows: Didactic/instructional 10 percent; Collaborative 75 percent; Feedback 10 percent; Reflective 5 percent. Furniture and technology need to directly support these modes.

Historically educational spaces have been based on a 100 percent didactic model for a cohort of around 30 students. The constraints this can present often result in teachers struggling to align current pedagogy and space.
Designing Learning Space

When talking to education institutions that are reviewing space or are planning to build new spaces, I am now requesting three things:

1. Documentation of the pedagogy and its modal makeup: what are the conceived learning outcomes.
2. The size of the overall cohort and project-based collaborative groups.
3. Consideration of what technology can be used to augment greater learning outcomes. This element has an obvious cost component and perhaps a less measurable time saving and enabling component. (This should be done at a reasonably early stage so it can be budgeted and value managed).

One area we have been investigating is how one space can be multimodal with a seamless transition between learning modes. The Collaborative Teaching and Learning Centre (CTLC) at the University of Queensland was the first of these types of spaces where the modes are switched: the physical space is modified by electronic screens and lighting to create smaller groups within the overall cohort (Figures 1, 3 & 10).

The technology then enables the lecturer to observe and share any one of the group’s work with another. This learning environment engages the student at a number of levels and plays on its theatrical transitions to constantly give visual clues about the mode of learning expected.

Not all spaces need to be the same. It is just as important to understand the potential of connected learning experiences that can transition from one space to another. i.e. A lecture theatre might make sense to be co-located with seminar spaces or collaborative teaching and learning spaces in order to make the most of the possibilities of different spaces that can support different learning modes.

An extension of this idea can begin to conceive the campus as a whole learning space continuum where multiple and diverse opportunities to learn can be found from the structured teacher led spaces all the way through to coffee shops, corridors, self-directed study places and other unstructured learning environments. Every square metre of space should be considered in enabling learning.

Unstructured Learning Environments

Following any structured learning experience students should be given the opportunity for its extension rather than being closed down due to lack of adequate support. Traditionally the support happened within the library and was a monastic individual pursuit. A library is one particular learning environment with great support in information literacy skills, but also able to support technology and course work. The library, when seen as an integral part of the social learning environment with appropriate staff and varied technological study options, begins to transform the idea of how it might exist within the overall learning framework. A librarian’s support can penetrate beyond the walls of the library into other social or peer to peer learning spaces.

Peer to peer/social learning spaces are some of the most talked about areas within educational institutions and also the least understood and studied. The re-badging of spaces as ‘learning commons’ or ‘hubs’ is often only the old computer laboratory in disguise (many computers in a room with a funky name, colours and furniture).

If the study experiences are limited and the opportunities with the onsite technology without diversity then there may cause for review. The ability to choose the most appropriate space for this to occur necessitates offering a variety of study options. Each of these options enables a different level of engagement with both other students and technology.

For the new Bainves Foundation Multi-media Learning Centre (MLC) at Bond University this metric was applied in both its conception and later post occupancy evaluation. To take a large unstructured open area, which was once the university’s art gallery (Figure 5), and make sense of creating a diverse study learning environment required a measured approach to configuring furniture and technology. The space needed to allow for a range of opportunities to work in different group scenarios, the pursuit of individual projects and allow students to engage with various digital formats. The location, form and configuration of the various furniture and technologies need to be understood in that each different study space has a distinct pedagogical intent with a spatial and technology arrangement carefully crafted to suit (Figures 6, 8 & 9). This space is unique in that it sits outside the traditional library but is managed by the library staff with integrated coursework/technology support. It was interesting to note that the uptake with technology as a study support tool was significantly greater than the First Year Engineering Learning Centre at the University of Queensland.

Experience and Context

The image of the classroom below describes in its layout the potential modes of learning capable in the space. It is rigidly didactic with very few opportunities to present other modes of teaching and learning. However the space also has an emotive content which also impacts the learning process.

The room is windowless, with hard and immovable furniture which is uncomfortable and difficult to access and the lights produce distracting glare. The emotive content of the space suggests a
negative response by both students and staff and despite the best teaching methods the space will challenge students’ ability to concentrate for any length of time. Although this is an extreme example we understand that well thought through functional space needs to also positively engage the senses. These spaces are people centric and as such must recognise their potential emotive responses to space. Design can influence the way we engage with people and place. We can change or modify behaviour through furniture, layout, colour and lighting. We can encourage people to stay longer. We can limit the time spent in one space. We can shift the way people work together and individually. We can indicate through lighting levels whether you can talk loudly or quietly. We can make a space feel busy and dynamic or quiet and reflective. All of these qualities need an understanding of the students’ context and expected learning outcomes as it differs from one university to the next, faculty to faculty, country to country.

The construction phase

What expertise should be provided by the university and what expertise should be brought in?

The process of construction has been well tested over many years where systems have been put in place to reduce risk in the procurement of educational space. A tension that has been increasingly more significant is the incorporation of technology within the design and construction of learning spaces. At the 2007 Association of Education Technology Managers (AETM) the issue of process of learning space procurement was raised. Universally the response to this subject was one of frustration. Issues of co-ordination through the design and construction phase often meant that there was abortive work or insufficient time allowed for fit-out and fit-off.

This issue can be broken down into various components:-

- Incorporation of technology at a strategic level.
- Incorporation of technology at a planning and design level.
- Installation of technology systems.
- Maintenance of technology systems.

There were very few conclusions that could be made about the best approach to the problem except that there was a consensus about the lack of understanding of what technology managers do and how they are embedded into university space procurement systems. This is an ongoing conversation which needs to be worked through with all the key stakeholders to begin to develop better systems that can interface with their existing procurement systems.
To move forward with the process, assuming we are building on knowledge brought forward from the evaluation of past projects, it is clear that the way we procure space needs to be revisited. There seems to be a need to be able to cut through the politics of space and set clearly-defined processes based on a common documented, agreed and understood language that can inform academics, executive administrators, facility managers and external consultants.

What has been presented here is a road map to the process based on the two year study and the outcomes of both of the colloquia. Using the PST framework as a reference, this has been tested on various projects where it has been applied and tested in my architectural practice on real projects rather than based only on theory. Other campuses need to develop their own roadmap based on their own particular context. The following points should at least be considered.

- Establish a common language for your pedagogies and break down learning into its various modes (i.e. Didactic, Collaborative, Feedback, Reflective, etc.).
- Document the learning modalities expected with the new spaces (pedagogy).
- Document the culture and size of the overall cohort and the project group subsets (space).
- Document the types of technology that can better enable the learning outcomes (technology).
- Understand how any new spaces fits within the overall campus structure and the ecology of the existing teaching and learning spaces (what spaces are over or under-supplied or distributed).
- How does the new space support the student at a faculty level and a campus level? (Space should be seen from their perspective. It should be noted that libraries generally already have a well-developed model).
- Ensure that at every stage the Pedagogy Space Technology framework is consistently reviewed.

Conclusion

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- Ensure that at every stage the Pedagogy Space Technology framework is consistently reviewed.
Evaluation and the Pedagogy-Space-Technology Framework (D. Powell)
Both the research work carried out by the project investigators and an analysis of the papers presented at the 2008 Next Generation Learning Spaces (NGLS) Colloquium, strongly indicate that the Pedagogy Space Technology (PST) framework has significant utility not just in the conception and design of teaching spaces but also in the crucial process of evaluation.

The project was able to track the creation process and outcomes of three generations of Collaborative Teaching and Learning Spaces at the University of Queensland (UQ). These were important and novel spaces, well suited to study and of significant interest nationally. Analysis strongly supports the contention that to produce better spaces, the cycle must include a robust evaluation of existing rooms that is used to inform the design of succeeding projects.

The PST framework taken as the basis for this project, places significant weight on analysis after the design phase. Each of the contributors to the 2008 Colloquium was asked to include significant sections on evaluation, with the questions drawn from the framework itself. The questions were specifically intended to place considerable emphasis on gathering evidence of outcomes which could be then evaluated against the design intent. An examination of the evaluation sections of the papers in succeeding chapters shows a wide variety of methodology and varying success in gathering consistent and useful evidence. One benefit of this diversity is that it brings the key issues regarding evaluation methodology into sharp focus.

Why Evaluate?

The papers presented at the colloquium gave ample evidence that universities are seeking to experiment with different kinds of learning and teaching spaces. In many cases, the completion of a new kind of learning space prompts a plethora of “me too” requests within and across institutions. The University of Queensland (UQ) is a case in point. Colloquium attendees in 2007 were able to examine the first faculty-based “Student Learning Centre” at UQ (though many already existed at other institutions). By 2008 however, UQ had completed another two such spaces with a further four under construction or in planning. While these spaces had different planners, builders and user groups, they were essentially similar in concept and pedagogic intent. The pace of work and overlapping schedules has meant that new centres are being designed, specified and tendered before others are even occupied, leaving little or no opportunity for evaluation and hence improvement of space design or technology provisioning. Clearly this is undesirable and the intention is that evaluations be undertaken in a timely way and that results might be shared across institutions so that we may move ahead and avoid repeating mistakes in novel spaces.

The focus of the NGLS project across two years was to follow the development of succeeding generations of new-style teaching space and to study longer term generational developments in library space. These two foci yielded an interesting divergence in evaluation issues as well. Roughly one third of the papers presented represent library spaces. The papers that were not library-based covered faculty learning spaces and “non-traditional” teaching spaces.

Library spaces tend to be constantly evolving, though punctuated by major refurbishments from time to time. By and large, libraries are both competent and experienced at self-evaluation. In contrast, teaching space in general is poorly represented in terms of evaluative studies. It seems likely that traditional teaching spaces are seen to be well understood and hence not in need of research or evaluation. Many of the non-library examples in literature and all of the examples presented here are revolutionary spaces, new kinds of teaching and learning spaces which are seeking to push change in practice. The UQ Collaborative Teaching and Learning Centre, Victoria University Engineering Project Based Learning Space and the Deakin Immersive Learning Environment are clear examples in this respect. While the library spaces focus more on finding out how users’ needs are changing and responding, the teaching space design and evaluation looks more intentional with a desire to shift behaviours.
Who are the evaluators?

- Users
- Builders
- Managers
- Researchers

Analysis of the literature (reflected in the colloquium) finds that the most prolific evaluators are librarians. Library staff members are active managers of their spaces and are constantly engaged with their users or clients. In general, librarians are committed to ongoing evaluation with often highly developed and standardised instruments. It is worth pointing out, however, that part of the goal in this case is the evaluation of library services, with only a portion relating to issues of space design. However, in seeking to understand the changing usage patterns, librarians are often in the position of having long-term data upon which to draw. This provides solid empirical evidence for change.

Interesting differences in perspective are evident in the evaluations of space performed by other groups. Some of the papers presented here are authored by space builders (both architects and technologists) who have a vested interest in improving their solutions as briefs become more standardised, and academics who study tertiary teaching practice are also becoming more active along with a smattering of independent researchers.

When should space be evaluated?

- Post Occupancy
- Pre Funding
- Short or long term

It is not surprising that since the majority of evaluative studies presented in this collection were conducted post occupancy and over a relatively short term that we can be beguiled into thinking of “evaluation” only in this narrow sense. However, other views of evaluation were raised during the discussion sessions that find support in the papers.

Deborah Terry (UQ Deputy Vice Chancellor Teaching and Learning) argued strongly for proper evaluation techniques to be applied to projects in the proposal stage in order to facilitate proper competitive funding decisions. This kind of evaluation of space looks to not just answer the question of how we should design and build space but also where should we build and if we should build at all. This view found broad agreement with contributors pointing also to the role of projects such as UQ ACTS (Advanced Concept Teaching Space) and Stanford’s Wallenberg Hall as experimental spaces whose ongoing evaluation was designed to inform the institution’s decision making regarding pedagogy, space and technology design across a range of projects.

Mitchell, Winslett and Howell (Queensland University of Technology) present a comprehensive plan for evaluation in an evolving and experimental space (Lab 2.0) that takes this approach. Both Graves (Griffith University) and Lee (Swinburne) present perspectives on pre-build evaluation and Andrews and Powell (UQ) sought to illuminate the ways in which issues uncovered in evaluation were directly applied to succeeding projects of the same genre. Others argued for longer term evaluation of space to address ongoing environmental concerns. This prompts a broader question as to why mature teaching spaces were not subject to regular and sustained evaluation in the same way as more closely managed learning spaces such as libraries.

What should be evaluated?

- Usage amount and patterns
- Satisfaction
- Meeting Goals
- Efficiency
- Learning Outcomes

Before moving to the question of methodology, it is instructive to review the goals of the evaluation. There are a variety of motivators for undertaking evaluation. Some appraisals appear to have the goal of validating a newly completed project and by extension, arguing for the creation of similar spaces. Simpler measures such as head counts and multiple choice user satisfaction questions are often the mainstay of these surveys. By contrast, research projects or design studies aimed at informing ongoing development typically strive to uncover more detail, both by targeting empirical measures and probing with open-ended questioning and focus groups.

Usage is of course a fundamental measure. It would be a brave or foolish project manager who would argue success in the face of meagre occupancy, so gate numbers will always have a place. However, understanding patterns of use over time is increasingly recognised as useful. Do patterns change hour-by-hour or shift notably between early, mid and later weeks of semester? Geographic patterns, such as understanding where users have been prior to entering the evaluated space and where they are headed can also be immensely useful in campus planning. Several of the studies presented attempted to gain a more sophisticated insight into the patterns of usage (the work presented by Jordan & Ziebell is an example) and this should be seen as an axis of study which is growing in importance.
It is debatable whether satisfaction surveys, while useful in the long term to plot changes over time, are valuable in a short-term or one-off evaluation. Questions such as “How would you rate the facilities of the space (Poor to Excellent on a 7 point scale)” would seem to offer little in the way of guidance to those planning similar projects. Satisfaction surveys, though commonly aimed at answering the question “should we build more?” don’t address continuous improvement. Open-ended questions are more valuable at uncovering issues that can be addressed.

The Pedagogy Space Technology framework gives more specific guidance, making explicit the contention that evaluation should be focused on measuring the degree to which the original goals, particularly the defined pedagogic goals, were met. Though overt in the colloquium design, relatively few of the studies presented made clear linkages in evaluation between the goals defined in the pedagogy and the outcomes. The PST framework asks: What types of learning and teaching are observed to take place? What is the evidence? In his summation, Professor Radcliffe (Purdue) asked the same questions in this context: What were we actually trying to achieve? What was the original intent? Surveys and statistics alone are not enough to measure success in this framework and observational studies are strongly suggested as we will see below.

Several threads in the forum addressed the desirability of evaluating spaces in terms of (improved) learning outcomes. Gallagher, Pearce and McCormack (Victoria University) argued strongly for this while noting the difficulties inherent in such an evaluation.

...a successful evaluation of the commons as a site for non-transmission forms of learning may depend to some extent on the success of the whole institution in moving away from transmission models and developing meta-cognition in its students.

Learning outcomes are clearly dependant on a significant number of variables beyond the space and the task of evaluating a space with respect to these outcomes when so many other contributing factors typically remain uncontrolled is difficult indeed. While in no way denying that the goal of improving learning outcomes should be paramount, the PST Framework takes a step back from trying to evaluate this directly. The goals of the space are defined in terms of fostering particular modes or patterns of teaching and learning. The primary evaluation therefore, is to determine whether or not such behaviours are observed and and which aspects of the space and technology are seen to enable, encourage and empower these types of teaching and learning activities. The task of determining whether the pedagogy improves student learning outcomes is left to a wider, possibly whole-of-institution based evaluation.

How is space evaluated?

- User Surveys
- Observation
- Empirical measures

Virtually all studies presented at the colloquium included user surveys in their actual or planned evaluation regimes. These varied from simple web-based questionnaires to structured interviews and focus groups. Evaluations of teaching spaces most commonly involved small sample sizes and often conducted separate surveys of student and teacher user groups. Learning spaces based on libraries showed the most consistency in surveys, with typically larger sample sizes though none of the studies presented attempted a statistically rigorous evaluation.

Analysis of open ended questions remains sketchy and anecdotal evidence suggests that inordinate weight can be placed on a single comment, particularly if it is pithy, humorous or particularly apt in its expression. These however remain the best source for understanding client needs and wants and are vital to the process of improvement. Several comments indicated that there is much
scope for co-operation amongst institutions in sharing survey instruments.

A very useful extension of this form is found in the paper by Gallagher, Pearce and McCormack (Victoria University) who used a combination of inputs from their casual staff (Library Rovers). The rovers are students employed part time and their reflections, blogs, journals and reports proved a rich source for feedback.

Observational studies hold considerable promise and are fundamental to the operation of the PST framework as already explained. Dane (in the Deakin Immersive Learning Environment study and later in contributions to the debate) argues strongly for observation as an evaluative tool and support for this technique can be found in evaluations by Randall and Wilson (Bond Pod Room) and Andrews and Powell (UQ CTLC) amongst others. The extension of direct observation to the review of time lapse video footage holds promise as the technique can uncover unexpected patterns by repeated review of wide angle footage taken in the space under study. Mitchell, Winslett and Howell (QUT) put forward a number of interesting indirect observational methods for tracking student activities by undertaking an analysis of content left on the whiteboards.

Though not featured in the papers, facilities managers at the forum expressed a desire for empirical measures to be included in evaluation. Examples cited include energy efficiency and it is likely that environmental investigations regarding power, thermal effectiveness and so on are going to be increasingly important. Hovering always on the margins, but unspoken at this event is the quantity surveyor’s measure of students/square metre. An observation emerging from the NGLS project is that innovative spaces such as Collaborative Learning Centres are inevitably space hungry compared with high student density lecture theatres and seminar rooms. It is therefore doubly important to gather evidence of positive outcomes from these spaces to counter the inevitable (and understandable) questions of space efficiency.

**Conclusion**

Evaluation is an essential part of the cycle of continuous improvement in space design. The colloquium papers represent a cross section of practice that provides a useful snapshot of evaluation across a range of spaces. The issues of when to evaluate (from pre-design to post occupancy); with what purpose and using which tools (user surveys, observational studies, empirical measures) deserve full consideration whether planning new space or considering refurbishment.
The Research Library as Learning Space: New Opportunities for Campus Development
(K. Webster)
The quotation in the title of this paper is from a student’s response to a library satisfaction survey conducted at The University of Queensland in August 2008. It was typical of the strong sense of satisfaction with, and importance of, the provision of library services in support of students and their learning, and of teachers and their teaching. What this paper sets out to do is explore the role that the Library plays in these activities, with particular reference to the sense of the Library as place.

This brief paper does not intend to provide a guide to designing an academic library, nor does it set out to provide a prescription for the creation of a learning space. There are many excellent guides to such endeavours, and readers will find much to stimulate their thinking elsewhere in this volume. Rather, it seeks to set out a view of the changing nature of the research library and the opportunities that are presented through this evolution better to support the learning needs of today’s, and tomorrow’s, students.

For almost the whole of the 20th century, interactions between students, researchers, teachers, library staff and collections have taken place within the physical boundaries of the library. The constraints of the print environment necessitated the construction of libraries which served as substantial warehouses of print materials and provided a place dedicated to the quiet and private study of books and journals. Service points were constructed to provide access to library staff for support in the use of library materials and to facilitate the borrowing of items that could be taken away from the confines of the library building. The nature of university teaching required little else, for it embraced a model where students attended lectures and tutorials, but demonstrated their learning outcomes in an assessment model that embraced solitary learning. The essay and the examination were the products of individual achievement.

The arrival of electronic forms of scholarly information resources over the past fifteen years, coupled with changes in teaching practices and comfort with technology, have brought rapid and significant change. The challenge for libraries for providers of learning space is inextricably linked at this moment in time with the need to make hard decisions about the future of legacy collections and the securing of sufficient funds to repurpose library space to meet the expectations of teachers and students operating in an academic world very different to that seen only one generation ago.

This paper maps out a number of themes. In doing so, it gives voice to library clients, using their words as examples of the issues faced in one large research library. Inevitably, some responses will reflect local matters but there is much to suggest that what we confront at The University of Queensland has wider application.

There is evidence to show that the Library remains an important part of decision making by prospective students and forms a significant part of the student academic experience (Cain & Reynolds 2006). Studies show high levels of importance attached to the Library, with students making regular visits, many on a daily basis (UQ Library 2006). However, changes in the wider environment all point to a suggestion of change: surely the emergence of widespread availability of information in electronic form points to the end of the Library? This paper considers these trends, and offers a new future for the library as a key provider of learning space on campus.

Library generations

It is worth reflecting briefly upon a generational model of library space design which maps out the movement in the concept of the library as place over the past thirty years. This model was conceived and developed by Hamilton Wilson who writes elsewhere in this volume.

In the first generation research library, the physical space can be considered collection centric: all design was focused upon the building as a physical repository of library collections. Space was provided in which library clients could consult and work with collections, but the notable design features were very much structured to support the storage of printed materials. This is most instantly recognised by the appearance of many mid-20th century library buildings with narrow windows, designed to keep out light which might damage the collections, irrespective of the wishes of library clients (Figure 1).

The second generation library coincides with the emergence of electronic information resources in the early 1990s, and a growth in customer care and quality initiatives which promoted a stronger focus upon and engagement with clients. The arrival of computers and CD-ROMs brought a degree of technological sophistication into the Library which was often ahead of the ability of library clients. Inviting spaces were created in which librarians and clients could work together, facilitating teaching and training and supportive exploration of new forms of electronic resources.

The third generation library recognises the different forms of learning expected of students in a 21st century university and also acknowledges the different behaviours and learning styles of new generations of students. Whilst provision for “formal”, quiet study continues, it has been complemented, and occasionally supplanted, by group study facilities, open discussion spaces and social networking environments. Several third generation libraries have been developed at The University of Queensland. One, at the University’s Ipswich campus, was created ab initio in a new, purpose-built facility (Figure 2). The Biological
Sciences Library, which re-opened in 2007, was designed in a wholly refurbished and extended building originally constructed in the early 1970s. Finally, a fourth generation library can be envisaged, one in which the Library forms part of a campus-wide learning environment and which is designed predominantly upon pedagogical principles. These changes in libraries are emblematic of a number of changes in the wider environment. These changes have both driven shifts in library design, but have also themselves been facilitated by changes in libraries and in the provision of academic information resources.

The changing environment

As foreshadowed above, the nature of pedagogy in the university has shifted. A growing emphasis has been placed upon student-centered learning, and upon group work and collaborative forms of assessment. These changes have driven a vast demand for spaces which foster and support emerging forms of learning activity. It is worth noting that this shift has not replaced, but has generally supplemented conventional forms of student learning.

Secondly, the nature of the student body has shifted, with the arrival at university of students frequently characterized as the net generation or Generation Y. These students have grown up surrounded by technology – most will have been born several years after the popularisation of personal computing and will have started school after the emergence of the Internet. They use technology to maintain contact with friends, are inquisitive and multi-tasking (Prensky 2001). The notion of sitting quietly in a Library for prolonged periods of time, reading and taking notes is as alien a concept as sitting motionless in a lecture listening and taking notes! As the environment in high schools shifts towards one which reflects the nature of today’s students, expectations of the provision of learning facilities in post-compulsory education will also shift.

We cannot ignore, either, the changing nature of library use. Conventionally, the Library existed to house printed collections and to make them available for consultation and borrowing. This mission was enhanced by the work of reference librarians who aided clients in the use of these collections. Such activity was conventionally measured by libraries in terms of numbers of loans per annum, numbers of reference questions answered, and the numbers of visits to libraries per annum.

The University of Queensland has experienced substantial decline in many traditional library activities. Loans of books to staff and students have fallen from more than 1.1 million in 2000 to just over 700,000 in 2008. Enquiry desk transactions have fallen from around 300,000 to 100,000. These trends can be observed in research libraries around the world and are to be expected: the availability of electronic information has overtaken the demand for print materials in many cases, and the success of information skills training and information literacy initiatives have had a positive impact upon client skill and confidence. One area of statistical growth has been the number of visits to libraries. The library has remained a popular destination, with more than 3 million visits to UQ libraries during 2008.

For many years, the library has been regarded as a core part of a university’s research infrastructure. At the heart of the university, a library with extensive collections built up over time and reflecting both a breadth and depth of scholarship, is regarded as a symbol of research excellence.
Whilst there are many great libraries in modest institutions, no great university is without an outstanding library. That status remains of tremendous importance, and few researchers would dispute the need for extensive collections of scholarly information and the support of experienced librarians in their scholarly endeavours, although with a strong preference for that support to be delivered in the school or laboratory rather than in the library. However, the notion of library as place in that dynamic has shifted. Academics report fewer visits to the library than was the case only a few years ago, and many predict a continued decline in years to come (RIN 2007). The importance of the library’s print collections is also diminishing, with desktop delivery of electronic information seen as a fundamental requirement (British Academy 2005). Many report a reluctance to visit the library to copy a journal article held on the library’s shelves: the effort required is seen as disproportionate to the likely academic benefit (RIN 2007).

**An opportunity to repurpose**

All of these strands can be brought together to form a hypothesis. We see lowered patterns of demand for conventional library services and collections, and a stronger emphasis upon the provision of information in electronic form. However, we can also see a real need for a place on campus which offers a forum for student interaction with technology, information and their peers. On occasion, these interactions might be strengthened by the support of librarians, offering guidance on information searching and evaluation, and by learning advisers skilled in strengthening student academic skills.

Against this backdrop, is there a place for the Library? Educause identified a schema of learning spaces to match a range of learning activities and styles (Oblinger 2006). Each of these can be mapped directly to forms of space and facility offered in most modern academic libraries. The significant barrier to a wholesale repurposing of the library as a major provider of learning space is the need to manage legacy collections of increasingly unused print materials, and service points configured to support interactions and activities in rapid decline.

I would argue that the path is clear: we need to take a long, hard look at the disposition of our collections, working collaboratively with colleagues to share the responsibility for maintaining lesser used material, much of which is available in electronic form. For example, The University of Queensland is part of an initiative of major university research libraries in Australia seeking to manage back runs of journals, electronic equivalents of which have also been purchased by those libraries. The project aims to identify a single print run of each journal title to be managed by a participating library, with each library looking after their fair share of titles. In turn, they will be able to remove from their collections those titles which are the responsibility of other libraries. Through this approach, a complete print archive will be maintained onshore for preservation purposes, but with library clients having access to the electronic version of the same titles. Initiatives such as this will provide an opportunity for libraries to reduce the storage space in library buildings, and redevelop the space released to provide support for learning activities. Whilst an approach of this sort might be less straightforward for monograph collections, immediate savings through responsible management of journal collections will yield considerable opportunities. As book digitisation projects, such as that managed by Google, come to maturity over the next decade, I have little doubt that similar approaches will be adopted.

**The UQ experience**

The first major development of this sort at The University of Queensland was the redevelopment of the Biological Sciences Library in 2006-2007 (Figure 3). A broad aim of that modernisation was to create a range of spaces for group study and social interaction. A review of the philosophy and initial outcomes of that work was presented at the first Next Generation Learning Spaces colloquium in 2007 (Webster 2007). Post-occupancy survey showed that our aims were justified: the demand for, and satisfaction with, group study rooms, open spaces and informal seating arrangements was great. However, there was an unexpected consequence. Formal, structured, individual space was still sought. The neighbouring Law Library reported an influx of science students seeking a quiet space. Intuitively, this demand was most evident as end of semester examinations drew near.

What became apparent was the need not only for redesigned learning space, but also for space which could be repurposed during the course of the academic cycle. At the start of the academic year, students sought group space, coupled with a need for library staff support for orientation activities. As the semester unfolded, staff support was less in demand, with even greater emphasis...
upon space for group work and class presentation preparation space. Finally, as the end of semester approached, study space for individual essay writing and exam revision was in high demand.

Two approaches have been adopted to address this need: we are beginning to zone library space by form of learning activity. Particular branches are designated as having facilities and spaces suited to particular learning activities. And individual libraries have specific zones designated for silent study, group work or “quiet” discussion. We have also invested in furniture design, for example commissioning partitions which can be mounted onto group tables to convert them into individual study carrels (Figure 4).

The client voice

In our work, we have been particularly struck by the willingness of students and academic staff to become part of our thinking, and to contribute to our design processes. A number of studies were conducted during 2008, and Jordan and Ziebell report these in this volume. We have also adopted the international LibQUAL+ library client satisfaction survey and this has allowed us to pay particular attention to clients’ perceptions of our learning environment. A study using the LibQUAL+ approach was conducted in August 2008 and revealed considerable interest in the library as space. Opinions seemed, at the time, to be conflicting. Consider the following responses to the provision of seating and space:

- We need more individual workspaces
- Provide more group areas
- There seems to be a lot of space for individual work in comparison to group work
- More individual study spaces. Limit the group spaces
- More availability of individual and group study room
- Quiet or discussion spaces would be preferable

Time and again we see comments which show that one group of respondents want a particular approach, and another group want the complete opposite. There appears to be no obvious cohort explanation for the nature of responses: age, academic field of study, gender, country of origin appear to have little pattern. What remains clear is that our clients want more: more space, more variety and more opportunity.

One respondent offered a succinct view:

“The facilities are very good. The availability of these services is nowhere near as good.”

We need also to proceed with some sensitivity and caution. In an academic environment, it is important to ensure that whatever we do is tested against academic need and expectation. Too many innovative library designs have failed because they were seen as fads or gimmicks. This was echoed by one academic respondent to the survey:

“Please don’t allow the anti-academics amongst your management to allow our libraries to be turned into playgrounds. Playgrounds are available everywhere to those that want them. If you drive those of us who want real libraries out, where can we go? (Plus, remember: the current fashion will pass, fly-by-night management will move on to the next fashion as always).”

The time for innovation is ripe, but we need to make haste – slowly. One final comment from a student:

“Everything in the Library is perfect – so far.”

References


What it is?

The overall design of the James Cook University (JCU) Cairns Library has resulted in a student learning hub being established where “the entire complex is a learning environment and supports the learning process from space to space” (Dittoe, 2002, p. 87). According to Dews and Clark (2000), the JCU Cairns Library was designed to play an important social and academic role. “In the context of the Cairns campus, this new building had to make a strong contribution toward building a sense of academic community and establishing a culture of learning” (p. 2).

The Library is a three storey building of 6,600 square meters. It is still the largest building on the Cairns campus. Completed in 2000 the whole project cost AUD$12.7 million, with the building and associated consultancy fees costing AUD$10 million. Designed on a ‘learning centre model’, the building brings together a range of resources, services and facilities. These include resource collections, information, help desk and reference services, computing facilities for general access and teaching, assistive technologies for students with disabilities and videoconferencing facilities.

Why it is?

The vision and leadership for the project was provided by Judith Clark, Manager, Information Services and Ted Dews, Director Central Services Office. Both were involved in the project from beginning to end: from the initial vision, development of the brief for the design consultants, project meetings throughout the construction phase through to the building occupation and post-occupancy survey. It was Judith Clark in particular who facilitated extensive collaboration between the staff, students, architects, program managers and facilities personnel at the University.

The Cairns Library provides spaces to encourage collaborative learning, those “educational activities in which human relationships are the key to welfare, achievement, and mastery” (Bruffee, 1999 cited in Graetz & Goliber, 2002, p. 83). Cornell (2002) argues that when “… people feel comfortable and valued they will come, stay and return. Learning communities will result” (p. 37). This approach is in keeping with research which suggests that because we learn through talking with others, we should plan interactive coffee shop-like spaces where students and staff can interact informally (Schunk, cited in Fielding, 1999). The Library contains specifically designed collaborative areas (Learning Centre, group study rooms, coffee shop, and lounge chairs) where students gather for social learning or noisy activities. There are also ‘support service areas’ where students go for specific purposes (Loans Desk, InfoHelp Desk, Disabilities Resources, Learning Centre). Finally there are the study areas on the top floor for quiet independent study (carrels, tables, special collection).

It is interesting to note that one area, the Learning Centre, acts as both a social, collaborative study area in addition to a support service area. A total of nine Teaching and Learning Development staff members share seven offices that adjoin an open plan general service point area. Computer login data (Adams, 2004) and user traffic counts (Anders et al., 2005) confirm that students prefer to access computers in spaces where support is located. Thus, by staff and students sharing common spaces, the staff becomes more accessible and the learning space design removes the traditional power structure implicit in the separation of staff offices and student learning spaces (Jamieson, 2003).

Tuan (1974) has explained how people develop affective bonds with a place or setting, whilst other researchers identify the need for an increased acknowledgement by institutions of the importance of learning spaces and resources “to understand better how learning does take place and the role of physical space in the learning process” (Chism & Bickford, 2002, p. 95). It is argued that changes from transmission models of teaching to constructivist thinking “where teachers serve as facilitators for active student engagement, where learning occurs in many locations, and where power is distributed across actors”, means that “learning space needs are seen to be far more dynamic and situational” (Chism, 2002, p. 10). Common factors amongst the many principles put forward by educators regarding effective learning spaces include a stress on flexibility, access to technology and interaction support as well as a match to learning goals (Chism & Bickford, 2002, p. 93).
What happens here?

The quantitative measures suggest that the Cairns Library is indeed functioning as a student-learning hub. On a campus with approximately 3000 students, the weekly Library user traffic was 6744 in the week studied, with 1421 movements into the Learning Centre, 483 enquiries at the InfoHelp Desk, 1211 library resources borrowed and a total of 3317 computer logins registered in the building’s computer workstations.

Focus group reflective diaries show that fifteen distinct learning spaces were identified and used by the participants during the monitoring period. Table 1 shows how the 253.8 hours that the twenty participants spent in the Library building were distributed amongst these fifteen learning spaces over the seven-day period. The focus group participants spent an average of 12.7 hours per week in Library learning spaces.

How is the space used?

A number of themes emerged from the focus group transcripts and these are summarised below.

The Library as a social learning hub

“One thing I like is that it [the Library] can be formal to do your things, but if you want to be social you can be social too, you can choose in-between (sic) them as you want.”

Many students indicated that they primarily used the Library for academic activities and that their purpose in coming to the building was to avoid distractions that were in the home such as partners, children, housework, computer games, telephones and television. There appeared to be a general agreement however, that social activities were also numerous in the Library due to the inevitable relationships that develop upon seeing the same people frequently in the Library space, or seeing people from the same class. Some students indicated a higher level of social interaction than others and cited reasons such as the nature of their study or their role as a Student Mentor that required them to approach, or be approached, by first-year students in need of assistance. One Student Mentor said that “the social aspect comes into it and it can be along the lines of academic stuff or just like, ahh, who do I see about this? So that’s why I say mine is more in-between [social and academic], “cause I play different roles when I come here”. It was clear from the comments and examples raised by students in all three focus groups that a high level of informal social interaction exists between student users of the Library, captured in the following statement by a student: “the social and the academic motivation is somehow linked to produce a good study outcome”.

Individual learning space needs

“Certain places for certain things”

From the explanations given in the focus groups regarding areas of the Library used, it was clear that students moved from space to space within the building according to their specific need or purpose. One student mentioned being able to study quietly in a silent area, talk about what you’re doing with friends in another area, and then return to quiet study, “whereas at home you can’t share what you’re doing and then you might start doing something then think Oh, I’ve got washing, you just focus”. Although not asked by the focus group convenors, students in each of the focus groups mentioned that they move to alternate spaces when they needed a “break” or “distraction”, for example the reference section, the reading room or the new books’ stand. Many students also mentioned enjoying being able to

Table 1: Hours Spent by Twenty Focus Group Participants in Cairns Library Learning Spaces from 29 September - 5 October 2005. One student spent 52 hours in the Learning Centre during the monitoring period.
talk freely in the Learning Centre, with one student saying that “I can’t work in complete silence because it drives me nuts”. Another student, however, mentioned that the conversation in the Learning Centre was the reason that they avoided the space. And yet another student said that they “generally head towards one particular area, like close to exam time I like peace and quiet, but during the semester I like the Learning Centre ‘cause you can talk”.

Interestingly, one student mentioned that they liked the social aspect of the top floor and yet admitted that this did not necessarily involve talking, “because going upstairs ‘cause most of your friends are up there, not that you talk upstairs but it’s just reassuring to see them”. This aspect of silent peer support was raised by another student who said that it was the presence of numerous fellow students similarly engaged in study/ concentration on the top floor that they found motivating them to study. It was apparent from the focus group discussions, that students self-selected spaces in the Library according to their own learning style or study pattern.

The nature of the learning task
“If you take the trek up there, you’re actually up there to do some work.”

The specific nature of an assignment also seemed to directly dictate student use of space in the Library. Students indicated that conversation was allowed on the ground floor and a quiet level of conversation was tolerated on the middle floor but conversation was definitely not allowed on the top floor: “if you make the trek up there, you’re actually up there to do some work”. The top floor is good when “you’re trying to work on this big assignment and it’s so in-depth” whereas for reflective tasks, less formal spaces seemed to be preferred.

The blue lounge chairs on the middle floor were frequently mentioned as a space for group-work, quiet reflection before a tutorial, for going through “what I have to talk about” or “if you’re all studying, you can just sit down and sort of go over where you’re at with each other and what assignment you’ve got due next”.

The year of study
“It took me a long time to feel brave enough to venture upstairs.”

A key finding from the focus group discussions was that student use of the Library space not only changed according to specific need or purpose but also tended to correlate with the length of time spent studying/enrolled at university. Students commented that they initially studied on the ground floor close to the support services of the Learning Centre, or the middle floor close to the support services of InfoHelp, and only after they felt confident did they move or ‘graduate’ to the top floor of the Library. This suggests that student pattern of movement within the Library is also influenced by their confidence and transition to a self-directed and independent learner.

The ambience of a learning space
“I love coming to the Library, I love the space, I love the people, I love the whole, probably ambience of the whole thing and the academic side of it.”

“And sometimes the artwork is like the looking out at the window sort of thing, sometimes it’s an inspiration, you need a splash of colour, and you go - ahhh – connection.”

A point consistently emphasised in each of the focus groups was the attraction of sitting beside a window or being able to see outside. For many students the windows on the top floor of the Library as well as in the Learning Centre were a key feature of the space. In contrast, another student mentioned that they had classes in a windowless conference room “and it was dreadful and what we did is by about week three we decided to draw a window on the whiteboard, drew some trees”.

In addition to temperature and lighting, including the natural light and closeness of rainforest, students also frequently mentioned the artwork or exhibitions in the Library building. Specific mention was made of the art displays in the Library foyer and how this visual display of colour contributed to the ambience of the building. Certain artworks such as the pictures in the Learning Centre were also said to be key contributors to the atmosphere of the place. That many students enjoy the art displays in the Library was not necessarily a surprising finding, but that this issue was repeatedly raised and discussed by all students in each of the three focus groups revealed an emphasis and consistency not initially predicted by the focus group convenors. Indeed it was a student-initiated topic and focus of discussion; the convenors did not ask specific questions related to artwork, visual displays, colour, natural lighting or the views through the windows.

Finally, a consistent theme in each focus group as to what contributed to the atmosphere, or why they liked the Library building, was “the people”. Students mentioned the professionalism and friendliness of the staff as well as the encouraging presence of fellow students. One student suggested: “it’s the building and the people, the helpfulness of the people, the relaxed, sort of informal relationships of the people who are helping you”. In regards to the feeling of the building, another student said that “it comes from every one of us”. To sum up in another student’s words: “I think there is more of a community here; we know each other.”

The availability of support services
A further positive factor students mentioned in regards to the Library related to the accessibility and quality of support services within certain spaces. The InfoHelp Desk was mentioned in each of the focus groups as a particularly useful source of support. Several mentions were made of the InfoHelp staff being “really helpful”, “incredibly helpful” or “extremely, actually brilliant customer service”; The Learning Centre was another area
of significant support for students with students mentioning the sense of community where "there's a certain sort of community feel, a vibe". Peer support was also noted with one student admitting to being "a little bit afraid about showing someone my work and he made it really easy and it's just that first semester, and after that I sort of got enough confidence to go off and do it myself".

What could be improved?

Services relating to printing, use of swipe cards, credit card and phone facilities were highlighted for improvement and a student with a disability suggested the provision of book trolleys. Interestingly, there were a number of suggestions to improve the social and collaborative spaces both inside and outside of the building. Items suggested included a hot water urn, outside furniture, drinking water fountains and more art exhibitions.

How is technology used?

Over 170 computer workstations are available throughout the Library building in a variety of flexible configurations: in teaching rooms of various sizes and configurations; one is available for 24-hour access; computer workstations configured for collaborative work in small study rooms and open plan areas; and workstations are also available for individuals to work in silent study areas. In addition, a wireless network is available throughout the building for laptop use, as are network ports for students to connect directly to the LAN.

The provision of videoconferencing facilities has expanded since the building opened. Videoconferencing is now available in five different rooms: an 80-seat conference centre, and tutorial rooms and meeting rooms of various sizes including an access grid facility. The provision of varied teaching rooms including computer laboratories, tutorial and lecture rooms helps connect academic staff and their classes with the library/learning environment.

Flexibility was a feature of the initial design brief and consequently phone, power and data connections can be provided almost anywhere in the building. In addition, the extensive use of modular furniture ensures that ‘staff only’ and public spaces can easily be reconfigured for different tasks and functions.

The provision of natural light is perhaps the most striking feature of the Library building. The whole facility is very energy efficient including the design of external wall and window shading, the roof insulation and sophisticated air-conditioning and lighting systems. No heating is required in the tropical climate other than for humidity control. Both the air-conditioning and lighting is controlled by programmable occupancy sensing systems, and the lighting system also takes account of the natural light available at different times of the day and adjusts accordingly.

How was the facility evaluated?

This paper brings together the evaluation and recording strategies used by Information Librarians as well as by Teaching and Learning Development staff. This creates new opportunities for collaboration that will provide colleagues as well as administrators with a fresh look at how students choose to access services and learning spaces. This broad approach is supported by Kalikoff (2001) who has investigated evaluation strategies for learning support services and puts the case for a ‘mosaic’ approach which involves the implementation of “...a series of textured and complementary evaluation strategies that aim to provide reliable and detailed information about what is being accomplished" (p.7).

The recording period for the research was of seven days’ duration over weeks seven and eight of Study Period Two, 2005. During this period the quantitative methods used included traffic movement into various sections of the Cairns Library, computer login data and InfoHelp Desk enquiries. Students were recruited at random to form focus groups with incentives of free printing and morning teas. The twenty participants included representatives from a range of student groups including students with disabilities, international students and students from all Faculties and all year and age levels. In this respect the focus groups assembled for this study avoid the limitation, identified by Gibbs (1997), of being unrepresentative.

The participants were divided into three groups that met for an hour during which a guided discussion was recorded on audiotape and key points summarised on a whiteboard. Topics raised for discussion by the researchers included a listing of all the areas the students chose to use and their reasons for doing so. The researchers were also interested to explore what motivated students to move from one area to another and if their use of the Library changed throughout the study period or indeed the course of their degree. The audiotapes from the three focus groups were transcribed and analysed for common themes and then checked for consistency with photographs of the whiteboard notes.

Focus group interaction highlights the participants’ view of the world, the language they use, and their values and beliefs about a subject. “Interaction also enables participants to ask questions of each other, as well as to re-evaluate and reconsider their own understandings of their specific experiences” (Kitzinger, 1994, cited in Gibbs 1997, p.3). The recording of the key points of each focus group discussion on a whiteboard encouraged interaction and re-evaluation amongst participants and also provided an immediate level of validation from the participants as to the accuracy of the
whiteboard summary. A reflective diary provided a further level of validation of the focus group transcripts. The diary, provided by the authors, required the participants to document their use of different learning spaces within the Library over the seven-day recording period.

**What were the main lessons learned?**

Wainwright (2004), in an overview of current influences affecting universities’ planning and organisation of learning and research support services, suggests that most university libraries across Australia have experienced a reduction in use. Yet all usage data for the JCU Cairns Library points to a reversal of this trend. It could well be that the evidence gathered in this research project reinforces an important message “that the future of the academic library lies in how well it meshes with a whole range of related services. Libraries do not exist separate from their universities” (Wainwright, 2004, p.2). Furthermore, the focus group data collected from Cairns Library users appear to exemplify the concept of a ‘learning commons’ where, according to Bennett (2003, cited in Wainwright, 2004), there should be mechanisms for collaborative learning as flexible spaces highly adaptive to changing student needs and preferences.

Dews and Clarke (2000) stated that an important design goal of the Cairns Library was to break down functional barriers and bring diverse parts of the organization into closer contact. Wainwright (2004) takes a broader view when he argues, “the key to collaborative facility success is not co-location but the total re-design of service delivery within an integrated university approach” (p.4). In considering such a total re-design of service delivery it is perhaps the model of a shared staff/student space used by the Learning Centre that offers exciting possibilities for future learning space design. Such a model should not only be restricted to university libraries but equally applied to the constructed environment of the entire university campus, too often characterized by lecture theatres separated from tutorial rooms which are in turn even further separated from staff offices. There are a number of examples where new teaching and learning spaces have been developed (see Jamieson, 2003 for an overview), yet there appear to be few examples where both staff and students share open collaborative spaces.

The functional considerations driving student use of learning spaces in the Cairns Library are related to the need for various levels of service and needs for collaborative, reflective and social spaces, all of which are in turn driven by the academic pursuit at hand. The ability to move easily from space to space to meet these needs appears to be another functional consideration for the students. However, the students participating in this study have also provided unsolicited and perceptive comments about architectural and interior design considerations. There is a clear message here in relation to the impacts that colour, natural light, artwork, open space, natural views and appropriate furniture configurations have on a student’s learning behaviour.

This paper has confirmed the positive impact of carefully designed learning spaces on student learning. The study has implications for future learning space design at JCU as well as other university campuses.

- In the future, a re-design of campus-wide learning environments may be required which will emulate the type of successful integration endorsed by students using the Cairns Library building.
- Experimentation and ongoing monitoring of student use of learning spaces should become part of the design and re-design processes.
- Consideration should be given to the use of shared student and staff spaces from the perspectives of collaborative learning as well as space efficiency.

Finally, when designing space to facilitate student learning, stakeholders should never lose sight of the importance that students place on the ambience of the space and their ability to move through and between areas according to their needs as independent learners.

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References


What is it?
The University of Queensland now has three Collaborative Teaching and Learning Centres which represent an evolution in understanding of the interrelation between pedagogy, space and technology. The original and largest centre, with six collaborative classrooms of three different types was opened in 2005 and is located in the Sir James Foots building on the St Lucia Campus. In 2007, a second generation space was opened at the Gatton Campus, sixty kilometres west of Brisbane, consisting of two combinable spaces accommodating 36 students each with a total of eight new-style pods (group working spaces). A further iteration of the design, in the form of a single, six-pod classroom for 60 students, has been incorporated into the new General Purpose North 4 building at St Lucia, opened during 2008.

Each of these projects has been part of larger developments, so the specific costs just of the collaborative spaces are hard to pin down. The first and largest project was part of a $24M new building project. Approximately $1.5M was spent on the Audio Visual, IT and furniture fit-out of the six spaces which together hold around 300 students. The fit-out of the newest space, part of a $54M six-storey building and designed with a significantly more ‘corporate’ feel, is estimated at around $0.9M. The Gatton Regional Collaborative Learning Centre involved the complete renovation of old laboratory space into the twin collaborative spaces, plus a videoconference-equipped teaching room and a standard seminar space. This entire project was budgeted at around $1.9M.

The original Collaborative Teaching and Learning Centre (CTLC) incorporates three distinct kinds of spaces each of which operate in three different teaching and learning modes under the command of the integrated control system. The 90 seat large collaborative teaching space can be thought of as a single, wide aspect, seminar space which physically divides into five separate group working spaces (called pods), each of which has its own IT facilities and a full audio visual sub-system with independent control of sound, projection and lights. The unique, lobed design of the interior, together with motorised screens and blinds create distinct group work ‘rooms’ within the space and the transformation between teacher-led (seminar) and group (pod) modes is overt and physical.

The second generation collaborative teaching spaces adjoin the small collaborative spaces and here the focus is on enabling group collaboration at a distance through videoconference and Access Grid facilities. The second-generation collaborative teaching
space at Gatton builds on the lessons learned from the evaluation of the St Lucia Centre. The room foregoes the room-within-a-room transformation typical of the large spaces at St Lucia in favour of concentrating the group activity around individual 10 seat pod tables. These pods, however still overtly signal the shift in pedagogical mode using large screen monitors which rise from the end of the table to enable on-screen group collaboration.

In the third generation space, the three modes of student free use, seminar and pod remain unchanged. However, a semicircular hub-and-spoke arrangement of the pods within the space gives a superior focus on the teacher-led pedagogies on one hand, while freeing extra space for group activity in the pod mode.

**Why it is?**

The full chronology of the development of UQ’s first CTLC has been captured by Peter Jamieson in an (as yet) unpublished paper (Jamieson, 2005). His insights into the inter-relationship between the teachers, architects and technologists were extraordinarily prescient and became an important contributor to the development of the Next Generation Learning Spaces Pedagogy-Space-Technology rubric. The subsequent, sometimes rocky story of the development of the second and third generation spaces demonstrates not only the importance of understanding these relationships, but also the difficulties of applying the key principles of harmonising Pedagogy, Space and Technology in the real world of conflicting politics, egos and budgets.

The inspiration for these new pedagogies at UQ came from Professor Margaret Gardner, then Deputy Vice Chancellor (Academic). Her previous experiments in new teaching methodologies had convinced her that new kinds of spaces were needed to move these pedagogies forward. New projects serve at least two important functions in this context. Not only do innovative teaching spaces directly and physically enable the desired practices, the rooms also serve as an unmistakable signal to the academic community that changes to teaching and learning practice will be encouraged and enabled by the University. Crucial as Professor Gardner’s input was, the spectacular and multiplicative strides that UQ has achieved in the last half decade would not have occurred without more of the “happy coincidences” which Jamieson (2005) highlights. Professor Gardner’s successor, Professor Michael Keniger is an architect and his professional understanding of the potential led him to immediately take up the baton, championing the continued innovative development of space and the integration of ground-breaking teaching technology. Proving that good fortune can come in threes, Professor Deborah Terry, as DVC Teaching and Learning has brought a psychologist’s and a teacher’s understanding to the leadership role, helping focus attention on the need to evaluate, consolidate and inspire academics to achieve within the spaces.

From its inception, it is true to say that the CTLC project was driven by pedagogy and the need to more effectively support changing teaching and learning practices. UQ’s Teaching and Educational Development Institute (TEDI), the body responsible for professional development of teaching in the University, has played a key role. At the design stage, successive directors of TEDI have worked to define the pedagogy which the spaces were to foster and provided input to brief the architects. Post completion, their focus has shifted to providing specific training to academics, fostering the take up of collaborative teaching through innovative grant programs linked to appropriate use of the spaces and undertaking evaluations. A significant contribution should be acknowledged from individual academics, especially those who have allowed case studies of their methodologies to be collected and distributed. Ultimately, the value of the project will be determined by the effectiveness of the teaching.

In respect of space, two kinds of contribution...
should be acknowledged. The first is budgetary and both experience with UQ’s own CTLC and examination of other learning spaces has shown that collaborative modes are significantly more demanding in terms of square metres/student than more traditional lecture theatres, seminar rooms or library quiet study spaces. In this project, both university executives (as capital managers) and facilities management (as space stewards) recognised the value of these kinds of spaces and were prepared to make the larger investments required to facilitate their creation and maintenance. The second contribution of course was in the design and construction phase in which the contribution of the project architects (Wilson Architects) has been paramount.

Technology has also been a significant factor, and was identified during the design phase as being crucial to the success of the project. However, the use of the technology in innovative ways by the academics post occupation has been just as important.

It should come as no surprise that the crucial decisions fall quite distinctly into the three key categorisations that are the basis of this paper, given that the project itself contributed to the categorisation. First, the decision to encourage the uptake of alternative pedagogies by the creation of purpose-designed space cannot be seen as anything other than key. The credit for the original decision belongs with Professor Gardner, but the existence of the second and third generations is due to the considered deliberation of Professor Keniger, supported by other leading academics in both the front line of teaching and in TEDI.

In respect of space, architect Hamilton Wilson chose first to embark on the arduous and potentially risky course of an extended set of consultations with academics during the extended pre-design (brief) and design stages. His willingness to not only create designs that were responsive to a need to enable specific behaviours but to then test those against research and experience gained from related learning environments (such as libraries) were fundamental to the final outcome. Within the space plan, different kinds of space were created to specifically cater for the needs of different students, identified through behavioural studies. The link between a new definition of the behaviours required (of students and academics) and the novel space designs can be clearly seen in the large and small collaborative spaces at St Lucia.

The operation of the CTLC is difficult to imagine now without the technology that empowers and encourages the mode changes in the teaching and learning, yet this novel design response came about largely by accident. A key element of the traditional technology specification process - the user requirements document - was missing, derailed by the novelty of the space design which simply didn’t fit with existing Audio Visual practice. As a result, the technology brief was not completed until very late in the design process, when many of the space provisions had already been fleshed out in considerable detail. Co-author Derek Powell, as a newcomer to technology for tertiary education (and ignorant of the ‘proper’ process) chose to separately research the requirements of the pedagogy, then responded to the novel space design with a theatrical solution born of experience in the entertainment and broadcast television industries.
What pedagogical principle(s) drove the design?

Throughout the original process, and to this day, the literature on collaborative teaching (as opposed to collaborative learning) is somewhat sparse. The design processes revolved around an imagined set of behaviours along with examples from the few projects existing in the area, such as Stanford’s Wallenberg Hall (see http://wallenberg.stanford.edu/). Care was taken not to rigorously define what was expected, so as not to stifle creativity and innovation, however three phases in a typical collaborative session were identified. Initial input from the academic to the whole group was envisioned as being necessary to set the parameters of the learning task and outline expectations for outcomes. This was to be matched with a report-back session of some sort where once again, an emphasis was on delivery to the whole group. Collaborative efforts were imagined as involving several stages, with subsets of the groups in twos and threes working on research, while sessions that involved the whole group were to be empowered by technology. From the start, the project space was also thought of as serving a function for independent student sessions as well as for timetabled teaching.

What happens here? (Pedagogy)

Current trends in learning space design and development are influenced by social constructivist approaches to teaching and learning (Brown & Long, 2006) which places greater emphasis on the collaborative aspects of teaching and learning. This is in line with Vygotsky’s views that social interactions are a crucial element in the learning process (Vygotsky, 1975). The spaces at both St Lucia and Gatton are intended to foster both constructivist approaches to teaching and learning, used for teaching. This is in keeping with social interactions such as group work, which once again, an emphasis was on delivery to the whole group. Collaborative efforts were imagined as involving several stages, with subsets of the groups in twos and threes working on research, while sessions that involved the whole group were to be empowered by technology.

How is the space used? (Space)

Clearly, space and fittings are going to play a key role in encouraging interaction and collaboration. Just as the individual tablet-arm furnishing of a tiered theatre inhibits discursive behaviour, seating and benching must become enablers in any collaborative space. The initial design made several kinds of provision for group work. Architect Hamilton Wilson deliberately varied elements such as group size in order to test the effect on instructional outcomes. However several more subtle effects were also tested between the ‘large’ and ‘small’ collaborative spaces. The larger rooms were seen as active noisy spaces. These rooms are predominantly white and light with the ability to moderate the space through lighting and screens. The other space is a more introverted ‘quieter’ space which is timber clad and warm with an organic, less structured feel (Wilson, 2008).

Though not fully tested by data collection to date, anecdotal evidence and commentaries have demonstrated that the distinctive architecture of the key spaces in the Sir James Foote’s CTLC has played a key role in the uptake of the rooms. The shapes are unlike any traditional space and announce clearly that different activities are expected and encouraged.

How is technology used? (Technology)

The categorisation of expected behaviours into independent study, teacher-led and group work led directly to the decision to use technology to not only facilitate these sets of activities but to signal expected behaviours and highlight the transitions between modes. As it was recognised that these kinds of teaching sessions would be new to both students and academics, it was felt that “signposting” the changes between formal presentations, group tasks and unstructured work was beneficial. The technology uses moving physical elements (such as electric screens, monitor lifts and blinds); lighting changes and directional audio cues to clarify expectations and assist the academic to remain in control of the session.

While the spaces are undoubtedly technology-rich, careful consideration was given to providing appropriate low-tech alternatives and to limiting complexity to foster uptake and optimise ease of use. Document cameras were provided specifically to stimulate brain-storming sessions using handwritten notes, diagrams or mind-maps. While whiteboards might serve a similar purpose, the document cameras allowed instant capture to PC, allowing the sessions to be recorded and shared amongst the group. Similarly, no specific collaborative software is installed in the CTLC. Such systems often impose significant learning curves, taking valuable class time better spent on learning tasks. Many common tools, ranging from simple email to web based aids such as Google Docs and wikis, have been successfully applied by groups using the CTLC with minimal time spent on process.

The goal was always to use technology to focus the learning, and not allow the technology to become the focus of the learning.

How was the facility evaluated?

Both the St Lucia CTLC and the Gatton R-CTLC are considered to be highly successful. Apart from the more formal evaluation strategies outlined...
below, success has been judged by usage and students and staff at both campuses have been enthusiastic in their use of the CTLCs from the beginning. According to room booking statistics, the timetabled usage of the St Lucia CTLC is about 70 percent. Outside of timetabled classes the spaces are commonly used for individual and collaborative learning student activities. Equally, the R-CTLC is heavily utilised at Gatton and students have requested later closing hours of the space to make further use of it. Further evidence of this success is seen in the increasing demand for these kinds of spaces on campus. In particular, the success of the spaces in terms of independent use by students has encouraged the building of several collaborative learning spaces based around identifiable cohorts such as the First Year Engineering Learning Centre.

A comprehensive evaluation of the CTLCs was conducted at St Lucia in 2006 and at St Lucia and Gatton in 2007. As these spaces are designated as both teaching and learning spaces the evaluation of the CTLCs sought to:

- Identify the ways in which both staff and students use the centre for teaching and learning activities;
- Identify the pedagogical approaches being adopted in the centres; and
- Identify the strengths and weaknesses in space and technology design and fit-out of the new learning spaces to inform further learning space developments.

Data was collected via institutional data (e.g. room booking data) observations of students; surveys of randomly selected students; surveys of randomly selected staff teaching in the centre and semi-structured interviews with selected staff. There was also informal data supplied anecdotally.

Observations of student usage of the St Lucia CTLC were conducted at the beginning the middle and the end of the semester. 180 randomly selected students completed the survey. These students were using the centre on the same day and were selected from all the rooms and spaces in the centre. Surveys were sent out to 80 staff listed as completing the training at the St Lucia CTLC; 25 staff completed the surveys.

Data from Gatton was obtained through the same approach. The survey was sent to 20 staff and seven staff completed the Gatton survey. Thirty students completed the student survey and participated in the observation activities. Additional data was also supplied by an individual lecturer’s research into the Gatton R-CTLC using student evaluations and an email poll of staff.

Observations of the space and feedback from the surveys indicate that teaching and learning activities vary from innovative and collaborative uses of the space to more traditional didactic teaching and learning uses. For some lecturers the opportunities provided by the space to engage in collaborative teaching and learning encouraged a range of collaborative activities, utilising the different modes of the spaces and integrating online learning tools, presentation technologies and group activities. Case studies were collected in the form of recorded interviews with six academics whose work covered different methods and fields of study.

In many cases, particularly in the smaller collaborative room at St Lucia and as indicated by the architect’s intentions outlined above, observations confirm that the space itself is utilised for group activities, with little use of the technology. Students often work in groups around the tables in the centre of the rooms, forming and reforming in informal ways for different aspects of their learning activities, facilitated by the lecturer. These applications demonstrate the space-pedagogy relationships of the CTLC, particularly the importance placed on face-to-face collaboration without necessarily having to utilise technologically mediated collaboration.

In individual study time, observations have shown that students also use the spaces for collaborative activities. Feedback from the student surveys indicates that 50 percent of St Lucia students using the CTLC use the space for collaborative learning activities (as opposed to the more usual individual, private study activities expected in libraries and similar spaces). The R-CTLC is also popular for collaborative learning activities outside of timetabled usage and students have indicated they would like more access to this space.

While many teaching applications of the CTLCs are in line with the intended usage, observations indicate that much teaching still takes traditional approaches and does not attempt to utilise the spaces for any kind of collaboration in the way that it is intended. The St Lucia staff survey also indicates that no lecturers are using the videoconferencing facilities or access grid applications available in the externally focussed collaboration rooms. Statistics obtained from room bookings indicate that the videoconferencing and access grid rooms, while heavily booked, are highly under-utilised for their intended applications.

**Which aspects of the space design and equipment worked and which did not?**

The original CTLC was blatantly experimental in its space and technology design. Indeed, there are radical differences in both the space design and the technology response between the ‘large’ and ‘small’ collaborative spaces in the Sir James Foots Building. In the realisation of the ‘second-generation’ space at the Gatton R-CTLC, a conscious attempt was made to respond to at least the expressed views of the academics and students by changing the design. In reality, the Gatton space imposed its own constraints, which made the project different in its own right and added constraints on the type of space design that could be realised.

While a full, evidence-based analysis was not carried out as an input to the new design, the tables below demonstrate that the ‘pedagogy-space-technology’ analysis had some utility in suggesting the broad areas in which design responses would be best suited to improve the usability of the new space.

The ability to move seamlessly between the different modes of teaching and learning is a
positive feature of the St Lucia CTLC, and one that lecturers found particularly beneficial. This aspect has been incorporated in the epod model at the R-CTLC and the new CTLC in GPN4 in St Lucia.

Staff and students identify the presentation options at both CTLCs as a highly successful aspect of the design. While the spaces are undoubtedly successful there are still improvements that would increase functioning and satisfaction with the spaces. Some of the main requests for improvements and the response to these requests are outlined in the Table 1.

What technologies were most effective at enhancing learning and teaching?

The survey results indicated that staff at the St Lucia CTLC have viewed favourably the range of options for presentation in particular the document camera and large screens in the pods. This is seen as being very valuable to supporting collaborative learning, allowing students to share and discuss their work easily.

This is also the experience of the staff and students at the R-CTLC. Students at Gatton find the epods to be extremely beneficial for collaborative activities, particularly the large screens in each epod that enable easy sharing of work.

“The big screen allows you to bring up what’s on one person’s computer, so everyone can see what’s being typed, allows everyone to have input, table allows everyone to see each other” (Gatton student).

<table>
<thead>
<tr>
<th>St Lucia CTLC</th>
<th>Rank</th>
<th>Category</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout of spaces – structured to support group work; comfortable</td>
<td>20%</td>
<td>Space/Technology</td>
<td>Design of pods, integration of technology, ease of use</td>
</tr>
<tr>
<td>Access to space and working areas</td>
<td>18.5%</td>
<td>Space</td>
<td>Design intention focusing on space to collaborate</td>
</tr>
<tr>
<td>Access to multiple computers</td>
<td>13%</td>
<td>Technology</td>
<td>Supported both the individuals and the groups</td>
</tr>
<tr>
<td>Good presentation resources</td>
<td>10%</td>
<td>Technology</td>
<td>Provision of a range of presentation options available to groups</td>
</tr>
<tr>
<td>The rooms enable group interaction</td>
<td>9%</td>
<td>Pedagogy</td>
<td>Design of pods, ability to work easily in groups</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gatton R-CTLC</th>
<th></th>
<th>Category</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pods supportive of group work</td>
<td>35%</td>
<td>Pedagogy</td>
<td>Self contained tables with presentation resources and computer / online access / addressed need for smaller group areas</td>
</tr>
<tr>
<td>Being able to share work on big screen, allowing input from everyone</td>
<td>16%</td>
<td>Technology</td>
<td>Incorporation of the plasma screen into the pod allows for ease of sharing- improvement on St Lucia CTLC</td>
</tr>
<tr>
<td>Different mode designs</td>
<td>10%</td>
<td>Technology</td>
<td>Positive aspect of St Lucia CTLC. Supports seamless change between different teaching and learning activities-minimal disruption.</td>
</tr>
<tr>
<td>Open spaces to encourage group work</td>
<td>5%</td>
<td>Space</td>
<td>Retained group interaction spaces identified as a positive in St Lucia CTLC-identified best used elements and retained/improved</td>
</tr>
</tbody>
</table>

Table 1. Aspects of the CTLC and R-CTLC which students identified as successful.
What were the main lessons learned?

As much as the technology, staff and students find the ‘space’ in the CTLC useful for a whole range of activities including role plays. The spaces provide considerable flexibility for a wide range of teaching and learning activities. This was particularly apparent in the smaller CTLC rooms at St Lucia where the table legs were damaged by being moved around. This small issue has now been addressed by placing casters on the tables and strengthening the table frames.

In the observations conducted at Gatton, the ways in which students participated in collaborative learning was particularly interesting. Students moved between individual work to group work and back. They worked individually on tasks, from time to time using the large screens in the pod to share and discuss their work, then moving back to individual work again.

A key aspect of the evaluations was the ability to use the information to refine further developments. In studying emerging issues, responding with appropriate design changes to the ‘next generation’ space, and then repeating the studies, we were engaging in a process similar to the Action Research Cycle (Carr & Kemmis, 1986; Kemmis & McTaggart, 1988). It is rare that cascading projects of this nature provide an opportunity for continuous improvement and the technology design at least, overtly used the inputs available to produce improved outcomes.

### Table 2: Aspects of the CTLC and R-CTLC which students identified as problematic.

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design layout to allow 2/4/10 groupings using more pods and smaller tables / group zones</td>
<td></td>
</tr>
<tr>
<td>Move to LCD screens instead of projectors and allow use in ‘individual’ mode</td>
<td></td>
</tr>
<tr>
<td>Flat walls provide better opportunities for whiteboards – maximize use by placing adjacent to each pod</td>
<td></td>
</tr>
</tbody>
</table>
What would you do differently next time?

User training and careful evaluation of the strengths and shortcomings of each succeeding project are both key to producing better and more cost-effective teaching and learning spaces. While the three generations of CTLC UQ have so far produced demonstrable improvements, more time for evaluation and consolidation of practice between projects might have produced even better outcomes.

Keeping a budget provision to go back after 12 months and correct shortcomings that have emerged in fit-out or technology is also a powerful (though rarely exercised) tool.

The crucial lesson that emerges from the experience of the CTLC and its derivatives is that successful design is a collaborative process and not a “cookie cutter” template that can be applied to differing places and spaces. Without appropriate involvement and feedback from users and managers of the proposed facilities and interaction during the design phase between the requirements of the pedagogy, the space and the technology, the chances of creating an expensive white elephant increase exponentially with budget.

References


Wilson, H. 2008, Collaborative Teaching and Learning Centre, Brisbane: The University of Queensland.
What is it?
The electrical engineering problem/project based learning (PBL) precinct at Victoria University (VU), Melbourne, Australia, is designed to support the transition from traditional lecture-based teaching to problem-based learning. In designing the learning spaces in the precinct, it was considered critical to support student team meetings, research, design, construction, testing, report writing and reflection, all of which are important aspects of the VU PBL model.

The learning spaces that exist in the PBL precinct have been specifically designed for engineering students who work in teams on PBL projects. The cost to complete the precinct was AUD$7M.

The physical environment is a PBL precinct that is made up of multiple PBL studios for small group work, a multifunction room or PBL common room, a soldering and experimentation workshop, plus secondary support infrastructure such as the technical store, small lecture theatre, printing services and the campus library (Figure 1).

Each student team is allocated a studio space (see Figures 2 and 3) that they can use for an entire semester; they effectively "own" the studio for that time. Each studio is approximately 3 x 3 metres in its dimensions and equipped with a table setting and chairs for 6 or 7 people, whiteboard and pin-board, a desktop computer, wireless network and one locker per student. Partitions are 1600 mm high, so it is possible to see over them when standing, but to have a degree of privacy when seated.

Academic staff member:
We did tell [the architects] what would happen and we did tell them that we'd like the studios set up in this environment with dividers and so on. We did tell them that we were going to have about four to six students in each studio… It gives students flexible learning because each studio has a computer for the students. Each studio has wireless access. Each student has a locker in the studios.

Dane, 2008.

Each team is assigned at least one academic staff member as its supervisor and is timetabled to meet with the supervisor in the studio for one hour per week. Supervisors also communicate with their allocated groups via Blackboard/WebCT and provide occasional support in the workshops.

The first stage of the PBL infrastructure development involved the construction of PBL studios as shown in Figures 2 and 3. The precinct also includes a workshop and an experimentation laboratory as shown in Figures 4 and 5. Each PBL team has its own workstation in this area.

The PBL laboratories are slightly different to traditional laboratories both in terms of design and student access. A major challenge has been to design laboratories that allow students to construct and test electronic and mechanical projects without continuous supervision. The laboratories are equipped with appropriate technical equipment and general-purpose...
The PBL so far at VU has been critically dependent on both the academic structure of the programs and on the development of appropriate infrastructure, especially the learning spaces to support the programs.

Figure 6 illustrates the main learning principles in three categories: cognitive learning, collaborative learning, and contents used in the Engineering curriculum.

Why is it?

Victoria University has a strong record of producing engineering graduates who are technically competent. However, today’s engineers also need well-developed generic attributes, including the skills associated with oral and written communication, working in teams, locating and evaluating information, and project management. This emphasis on generic attributes is reflected in the accreditation requirements of the professional body in engineering. Engineers Australia:

Graduates from an accredited program should have the following attributes:

- ability to apply knowledge of basic science and engineering fundamentals;
- ability to communicate effectively, not only with engineers but also with the community at large;
- in-depth technical competence in at least one engineering discipline;
- ability to undertake problem identification, formulation and solution;
- ability to utilise a systems approach to design and operational performance;
- ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member;
- understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development;
- understanding of the principles of sustainable design and development;
- understanding of professional and ethical responsibilities and commitment to them; and
- expectation of the need to undertake lifelong learning, and capacity to do so.

Engineers Australia, 2006

In order to address this need, the Vice-Chancellor of VU created a working party comprising academic staff and a large contingent of industry partners. It worked throughout late 2004 and into 2005 to identify those competencies of an engineer that industry really seeks. The industry partners expressed a view that an engineer should possess strong oral and written communication skills, project management skills and technical knowledge. This view was one of the major drivers for change in the undergraduate engineering programs in the Faculty of Health, Engineering and Science at VU, and led to the shift from the traditional lecture-based curriculum to a PBL curriculum. The other major driver for change was the desire to improve retention rates in engineering programs. These drivers are consistent with the notion that curriculum change is highly influenced by external social factors.

Following the decision to introduce an engineering PBL curriculum and associated infrastructure at VU, a consultant was appointed to advise on the curriculum change process and to assist with the first step in implementing the change to PBL (Parr, 2005). The PBL so far at VU has been critically dependent on both the academic structure of the programs and on the development of appropriate infrastructure, especially the learning spaces to support the programs.

The PBL pedagogical principles, which drive the Engineering curriculum, were the main driver for the design. The following learning principles have been extensively used and employed in most, if not all, PBL models:

- Project-based learning
- Participant-directed or “self-directed” learning
- Activity-based learning
- Interdisciplinary learning
- Analytical thinking
- Team-based learning

Figure 6 illustrates the main learning principles in three categories: cognitive learning, collaborative learning, and contents used in the Engineering curriculum.

The cognitive learning category involves learning that is scheduled around some types of problems
and that is achieved through project work. Here the problem is the initialisation of students’ learning and in this way, learning is placed in context. The idea behind learning being achieved through project work means that a unique task involving complex problem analysis is usually required.

The collaborative learning category encompasses learning that takes place in teams and is self-directed. Here learning takes place through communication that will usually involve a team of students with similar objectives. An integral part of this process is that students learn from each other, and take ownership in what they do, especially in the formulation of the teams.

The contents category involves multidisciplinary learning and analytical thinking. Here the work that students perform can be spread across traditional field-related boundaries, as well as outside these boundaries. Analytical thinking is another critical learning principle where theory and practice come together. It is indicated in Figure 6 that practice is across all of the learning principles of the VU Engineering PBL model. This is very important, as it not only indicates that practice is the integral part of the model but that it is performed while achieving all of the abovementioned learning principles.

**What happens here?**

A PBL program requires students to work in teams, ideally teams of about five to six students in early years and individually or teams of two to three in final year. In each semester, the students take one PBL unit of study that constitutes half their study load and two non-PBL units of study that are taught conventionally. They therefore work on PBL projects for approximately half of their study time in each semester.

The PBL cycle requires each team to meet to identify learning issues (what they need to learn in order to address the technical problem) and allocate specific issues to members of the team to research. The next stage is for the members of the team to research these issues, either individually or in small sub-groups, and then report back to the team what they have found. What happens next depends on the required output of the problem or project. Typically, individual team members or sub-groups design, build and test components of a final product before working as a team on assembling that product and the technical report that accompanies it. Reflection on the learning experience is an essential part of the PBL approach, so students prepare both individual and team reflective reports during the PBL cycle.

The PBL cycle therefore involves a range of team and individual activities. Each team meets formally once a week with its supervisor and, in first year, each team will typically have two supervisors – an engineering academic and a language and communication academic. Between these formal meetings, there are unsupervised team meetings.

There is also a range of other group activities in which all teams participate. For example, in first year, students attend workshops that introduce them to the PBL process, working in teams and project management. A series of language and communication workshops focusing on writing both technical and reflective reports is also provided. Individual activities include locating resources, writing software, building and testing equipment, and writing sections of reports and presentations.

Thus, although work in small teams lies at the heart of PBL, the PBL precinct must also support learning in larger groups in a workshop format and students working independently or in groups of two or three. It must support students working around a whiteboard or a computer screen as well as working in a workshop to build and test prototypes.

**How is the space used?**

A formal study of the level of use of the studios, laboratories and multifunction room has not been conducted as yet. However, informal observation confirms that students use the PBL precinct extensively throughout the day, with some students also using it in the evenings. The various spaces are used for the many team and individual activities for which they were designed but also for some that were not considered in the design phase. For example, it was not envisaged that the studios would be used as the set for several short videos of the student view of PBL that some teams produced and uploaded to YouTube!
The pattern of use of the PBL precinct in the first year of operation was somewhat different from what was planned, in that there were fewer unsupervised meetings of full PBL teams than expected and more work by individuals and groups of two or three. Working in teams was a challenge, as reflected in responses to student surveys and focus groups:

Students acknowledged that working in teams would be a feature of their working lives and many saw the benefits of learning how to work effectively in teams. They identified benefits of team projects such as developing friendships and socialising, sharing the workload, gaining different perspectives on a given problem, support and motivation. Relatively few students reported being members of effective teams, characterised by respect, collaboration, rotating leadership, task focus, productivity, and meeting deadlines. Most students, unsurprisingly, found that teamwork was challenging. In particular, many reported being in teams with students who did not contribute to the work of the team or even attend team meetings.


Students told us that they sometimes found it difficult to arrange team meetings because most of them had part-time employment off campus and some had family commitments as well. Some students chose to meet off campus because they lived in the same neighbourhood.

While there were fewer meetings of full teams than expected, it was observed that the PBL precinct rapidly became the students’ “home” on campus. The PBL common room has developed as a space where students meet informally, use computer facilities, use kitchen facilities, conduct presentations, attend occasional lectures and workshops, and where staff also meet for PBL planning and coordination. It is generally a non-timetabled space with open access, apart from occasional dedicated meetings, workshops and presentations.

Researcher:

The common studio, do you use that for other events apart from presentations?

Academic staff member:

We do use them for other meetings... the meetings [for] all the academics...we usually meet in there to discuss PBL. Usually we meet two or three times a semester... The language and communications workshops are being conducted in the PBL common studio.

Dane, 2008.

The multifunctional design of this space has enabled its more informal use by students. Students sometimes use this space for watching movies, making movies, playing computer games and other social activities. This appears to contribute to the sense of community that is evident throughout the precinct and is therefore not discouraged.
Technical staff member:

One of the most important things is the fact that the students have the sense of community, and therefore we set up a facility where they had that, where they could come and go, they had the community; they had space where they could sit down, do their work, do their team-based work, and where their supervisors could go in and meet them. The studios have multiple functions, one of which is where they can just go in and work, but then also where they can have their supervisor meetings, their group team meetings, but overall I think the fact that they’re all located within the one space gives the students a sense of community.

Dane, 2008.

Moreover, students do not use the spaces exclusively for their PBL activities and for social activities. As noted above, PBL units of study only constitute half of the study load and students also undertake two units that are conventionally taught. While these units tend to utilise individual assessment tasks, the students often work together on these tasks in the PBL precinct. They therefore make considerable use of the PBL precinct for individual and small group study related to non-PBL units.

Academic staff member:

In their studio they don’t just all work on their PBL problems, but I have witnessed them working on their tutorial questions, for other subject-based units.

Researcher:

So when they’re not required to work collaboratively they’re still working collaboratively?

Academic staff member:

Yes, that’s right, for other subjects as well.

Dane, 2008.

How is technology used?

When the PBL precinct was designed, computers were deliberately not installed, on the assumption that most students would bring their own laptops to the studios. Student feedback in the first year of operation indicated that students chose to work instead in the Library or open-access computer laboratories where they could access the internet and do their research more easily. Desktop computers were then placed in the studios and almost immediately student use of the studios increased.

The University’s online learning system is Blackboard/WebCT and it was used to support the work of PBL groups, but in the first year of PBL operation its use by both students and staff was somewhat variable:

Participants reported that they found it difficult to find time for face-to-face team meetings. WebCT was offered as a communication tool to complement face-to-face meetings but it was evident that it was not used a great deal. When it was used, students generally just used the basic features. Some supervisors encouraged students to use WebCT and reportedly checked the amount of traffic from time to time. Participants from both groups claimed that they were not shown how to use WebCT effectively. In any case, some participants found WebCT clunky and preferred to use other online tools, such as Hotmail and Messenger, for team communication.


In broad terms, technology plays a central role in any undergraduate engineering course and the PBL units of study at VU are no exception. As noted above, the PBL laboratories were the site of considerable activity which presented new challenges for the technical staff:

Technical staff member:

There’s a very important change in the role of the technical support staff, from problem-based learning, in that it shrinks the gap between academics and support personnel. Because we rely on the students to find out information and learning for themselves to a large extent with the problem-based learning, they will come and ask for help from technical staff… we try and direct them to the source where they can find the information where they will be able to do it for themselves.

When you have the [technical] staff from the beginning, you can work with, because the technical staff has familiarity in terms of facilities, equipment, everything that we have in the school, we are also familiar with how to obtain certain bits of equipment. It helps in saying ‘okay, we can plan ahead, we can obtain those things, they’re quite cheap’, instead of ‘oh, that’s going to cost us a lot of money if you want to go in that direction’. So it sort of gives you a bit of perspective in what sort of projects we can do.

It’s almost like the PBL cycle we go through, we sit down, we brainstorm, then we go, everybody goes off working with particular parts of the [problem], then we come back and we produce a problem for the students to work on. So it’s sort of like the PBL process in what we’re doing in terms of planning the PBL problems themselves.

Dane, 2008.
When all the PBL facilities are eventually completed, they will include a range of laboratories for students at different year levels:

Technical staff member:

This room has been decked out with computers where they can run simulations and things like that, as well as a section on where they can just do soldering, but also for testing and for checking their circuits with the test and measuring equipment… we have generators, power supplies, frequency counters, which they will be able to use and which they do use, as well as computers with computer aided design software, simulation software.

Academic staff member:

Every team has a dedicated time and a bench in the soldering area…to avoid a lot of groups going into the laboratory and hogging the laboratory I suppose, this is integrated into the timetable.

Technical staff member:

We have two new laboratories being built there, where the students will be able to manufacture circuit boards, so that will allow our students to go from the design stage of electronics through to the manufacture of completed products.

Dane, 2008.

How was the facility evaluated?

The student experience of PBL is evaluated each year. After the first year of operation in 2006, a comprehensive report based on a series of student questionnaires and focus groups was prepared. It found that the students were generally positive about their PBL experience:

...Students on the whole reported enjoying PBL. In particular, the hands-on style of learning and working in teams were aspects that many students enjoyed. They were also mostly supportive of what PBL was designed to achieve and they generally understood the principles of PBL, such as self-directed learning, collaborative learning and a focus on engineering practice. There was general agreement that this style of learning would help prepare them for working life. They appreciated the importance of developing the capabilities of working in teams, communicating effectively and managing their own time and their own learning.

In their questionnaire responses and in the focus groups, most students reported learning a great deal from their PBL experience. Most reported improvements in generic skills such as working without direct supervision, writing both technical reports and reflective reports, working on problems, working effectively as a member of a team, reflecting on their learning, working without direct supervision, speaking in front of a group and managing their time effectively. Most also agreed that they had learnt technical skills and knowledge in PBL, although in second semester they were less sure that they had learnt much in the way of technical skills and knowledge. In both semesters, the students were less sure that they had learnt about using the library or about diversity. Most students were also doubtful that they used what they learnt in PBL in their non-PBL subjects...

Students consistently identified the role that working in teams played in helping them to develop friendships within the class, especially in first semester. The value of this cannot be understated, as social integration in first year university is considered an important factor in student retention. Given the University’s current focus on improving the retention of its students, this is an encouraging finding.


This substantially positive evaluation did not focus on the PBL precinct as such, although it was the stage on which both students and staff performed. When explicit questions were asked in student focus groups about the facility, the response was positive:

...students liked the new studio spaces and liked having the individual team suites. However, they noted that [they] would like access to computers in their PBL suites rather than having to go out to the PBL multipurpose room:

"I think it would help if each room has, like, has a computer or … so then if we need to, like, access our email when we’re discussing stuff or we need to show something on a computer screen, it’s right there. We do not need to go out of here."

They also commented on other minor issues including that markings on the white boards weren’t easy to rub off and that they would like a fridge in the multi-purpose room.

Gabb & Keating, 2007: 60.
Stojcevski administered a short questionnaire on the PBL studios to the 2007 cohort in which students were asked to respond to the following:

- How would you rate the PBL studios in terms of a teaching facility?
- How would you rate the facilities within the PBL studios?
- Please also provide your comments in terms of the benefits and difficulties, in terms of the PBL studios used as a teaching facility?

The response scale used for the first two items was 1 (Very poor), 2 (Poor), 3 (Good), 4 (Very good) and 5 (Excellent). The results for these two items are summarised in Figures 7 and 8 below.

In addition, 32 of the 37 students responded to the third open-ended item: “Please also provide your comments in terms of the benefits and difficulties, in terms of the PBL studios used as a teaching facility?” These responses were subjected to content analysis and the following common themes identified:

**Benefits**

- Dedicated space for each team for the entire semester.
- Supervisors know where to find students.
- High-quality technology.

**Difficulties**

- Initial access problems (electronic key allocation).
- No microwave and refrigerator supplied.

These results suggest that the students strongly valued the PBL studios and appreciated both the space itself and the equipment provided. Their responses to the open-ended question indicate again that they identify the space as “theirs” and their only real request is to make the space more “home-like”.

After interviewing staff members, Dane (2008) reported there is consensus that the PBL precinct has been a tremendous success, supporting the range of PBL activities in which students, technical support staff and academics engage. A number of interviewees spoke of the sense of community that has been achieved by creating a physical environment that enables collaboration, with access to appropriate and relevant resources. The contention is that students become independent learners in a supportive environment that brings them into contact with practice-related problems.

**What are the main lessons learned?**

The design of the PBL spaces influenced both student and staff behaviour. The studios encouraged students to work collaboratively within their teams on a range of tasks, PBL and non-PBL related, whereas the common space encouraged cross-team activities within the larger group. Because the PBL precinct was “colonised” by the students, teaching staff used the space with less authority than they demonstrated in traditional teaching spaces such as lecture theatres and laboratories. Thus, the design of the space reinforced the shift in staff role from instructor (i.e. “sage on the stage”) to facilitator (i.e. “guide on the side”). In another VU PBL program not reported here, individual studios were not constructed and the main space in that precinct closely resembles a classroom. Not surprisingly, staff members that teach in this space were more likely to slip into instructor mode and the students demonstrated less signs of ownership of the space.

Students greatly value having their own place, especially on a campus with limited spaces for social interaction. The campus has few spaces where students can gather, other than two fairly spartan cafeterias. Thanks to recent landscaping work, there are now several external spaces where students can meet in good weather but there are very few internal spaces in inclement weather. It is therefore not surprising that the students used the meeting spaces provided in the PBL precinct, especially when a computer was provided in each PBL studio.

It is important to involve both academic staff and technical staff in planning and development of PBL problems/projects. At least half of the work of a PBL student revolves around the PBL project and most projects involve designing, building and testing equipment. Providing facilities for this “hands-on” work is therefore an important design consideration. Members of the technical staff were initially involved in this process mainly because of their expertise in occupational health and safety but, as some of the interview data reported above attests, their contribution extended well beyond this. Indeed, technical staff members have a key role to play not only in designing the physical facilities but also in designing the projects that drive the activity in the facilities.

It is also important to provide some desktop computers rather than relying on student laptops. The initial assumption was that the students would use their own laptops in the PBL precinct, so no desktop computers were installed. Frequent student requests for computers in the PBL studios showed that this assumption was incorrect. Installing a desktop computer in each PBL studio then led to increased student usage of the studios. It is not known whether a preference for using University machines represents a low level of laptop ownership by this group of students, an unwillingness to lug heavy laptops around all day or a preference for working collaboratively around a larger screen. This is a topic requiring further research. Both the high level of usage of library computers and a recent survey of VU students confirm that, despite the fact that most students have broadband access at home, there continues to be a strong demand for open access computers on campus (Gabb et al., 2007). For these students, at least, the age of the omnipresent laptop has not yet arrived.
The PBL precinct enables students to develop a sense of community and ownership of studios, leading them to use the precinct for activities other than their formal PBL units. When appropriate resources are conveniently located and students are provided with facilities they feel comfortable to use, the facilities appear more likely to be well utilised. In the initial implementation of the PBL studios, there was some concern that the facilities were not being well used. Informal feedback from students confirmed they were going elsewhere primarily to access computers, which instigated the installation of fixed computers into the studios. From this point on, utilisation of the studios improved noticeably.

The proximity of studios to each other also contributes to the sense of community in the precinct. Student teams can interact with each other, develop friendships, discuss assignments, and generally provide each other with collegiate support. The PBL common room is essentially a social space, allowing students to interact informally through eating, playing computer games, and watching DVDs, etc. That these activities are not discouraged contributes to the sense of belonging students have in that environment, making it more desirable for them to be there with their colleagues, rather than “somewhere else”. In this kind of physical environment social activities tend to blend more seamlessly with educational activities, leading to an increase in collaborative learning and ultimately to increased retention and engagement of students. The research literature on retention tells us that both academic integration and social integration are central to retaining students, especially in their first year (Gabb et al., 2006). It also tells us that collaborative learning activities and informal interaction between students and staff improve integration. PBL emphasises both of these activities and the PBL precinct provides spaces that support and encourage these important functions.

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Deakin University Immersive Learning Environment (DILE): an evaluation

What it is?

The Deakin Immersive Learning Environment (DILE), or studio as it is also referred to, is an ‘L’ shaped classroom, designed to support collaborative learning (figures 2 and 3). It is located on the north western fringe of the Burwood campus and was completed in late 2005. Undergraduate Multimedia students have been the primary users of the studio, but the intention is to make it accessible to a broad range of disciplines. Approximately 105m² in size with a 5 metre high ceiling, the space has a capacity of 30 students, although most timetabled classes are for units with enrolments of approximately 20 students. Duration of classes is two or three hours and is preceded by a lecture conducted in a traditional lecture theatre. Undergraduate students are the primary users of the space, but all students are able to access the studio outside of timetabled commitments.

Why it is?

The initiative for the new collaborative learning studio was generated by a Multimedia academic (T1) who experienced significant frustration attempting to apply active teaching and learning in a computer laboratory, recognising that collaborative activities were difficult to practice in that type of space. T1 began a dialogue with the facility manager about the possible development of a new type of classroom that would support collaborative learning. The facility manager was cognizant of new types of learning environments internationally, stating he was “influenced by what was happening through the SCUP network”. So when T1 began discussing the idea of a space for collaborative learning, the facility manager immediately supported the concept.

The facility manager was able to secure a space within a new major teaching precinct already under construction. Selection of an architect defaulted to the architects commissioned to the new project. A meeting took place between T1, the architect, the facility manager, and others, whereby T1 verbally articulated the pedagogical vision and intention of the space. Due to the significant time pressures associated with the base building already being under construction, notes taken at that meeting effectively formed the brief. The architects captured the client requirements and developed a plan simultaneously.

A critical concept of the educational vision expressed by T1 related to the perceived high use of computers in multimedia courses. In actuality, industry practice is more about problem solving and resulted in T1’s aim of getting students “away from the computer; to understand that 95 percent of their work is conceptual and that the last 5 percent, the production of any digital media product, is at the computer.” This became the rationale for a small number of computers to be incorporated into the studio; to establish a hierarchy of activities that de-emphasised the importance of computer-based activities and promoted places for group discussion where problem-solving would take place.

T1: The design…is premised on the assumption that students will have to work collaboratively…. [Multimedia] students don’t enjoy collaborative work, so that’s the reason why there is a big emphasis on comfort. There’s the couches…and stuff like that…. Given the nature of our industry, collaborative learning is essential. Students don’t like it. They actually learn to like it.

The features of the studio that have the most impact upon teaching and learning are:

- Board room table
- Lounge
- Fixed computers and bench
- Presentation desk

How these spatial features support collaborative learning will be explained in greater detail shortly.
Architect: From a relaxed sort of more individual-based approach, through to a more formal but still relaxed group approach (which was then obviously the higher tables), through to a more rigorous one-on-one sort of approach that you could promote most of your pedagogies.

T1: Students need to feel comfortable in the space; they need to feel that they own it… the ability for things like furniture, and any of the other resources were movable, completely movable. So whilst I have an ideal of how the rooms would be set up, it’s irrelevant… it is the students who are in control of the way in which the room is set out and I think that’s really important… I’m very concerned to ensure that students enjoy the process of learning; that they love it, that they embrace it, that they are completely immersed in it.

At the briefing meeting the architect commenced sketching in response to T1’s description, incorporating a variety of learning settings for group work modes. The initial sketch included an area for large group meetings, the ‘board room table’, a lounge for informal gathering, round tables for quick group discussions, and a bench with three fixed computers. A ‘presentation desk’ containing a fourth computer was located at the southern end of the room, along with a fixed whiteboard, pull-down projection screen and a data projector fixed from the ceiling. With time pressures bearing down on the team, an expedient design and approval process ensued. Furniture was ordered and construction completed in time for commencement of semester 1, 2006.

What Happens Here?
The Deakin Immersive Learning Environment supports collaborative learning in a number of ways. Firstly, a range of different settings have been created to enable a diverse range of teaching and learning activities, for example, brainstorming, researching on the internet, problem-solving, preparing presentations, presenting to the whole class, debriefing a lecture, discussing assignments, etc. Secondly, the academics who teach in the DILE are able to plan their subjects and classes with collaborative learning and the physical setting in mind. A variety of collaborative learning tasks are able to be engaged with, from short duration activities best suited to first year students, to semester-long projects that are undertaken by third year students.

As part of the author's PhD research into ‘new generation learning environments for higher education’, human ethics approval was achieved to conduct an evaluation of the Deakin University Immersive Learning Environment, utilising the following methodology:

1. Interview a range of people instrumental in the delivery of the DILE, including the architect, facility manager, I.T. Manager, and others as nominated by the facility manager.
2. Interview a number of academics who currently teach in the DILE, to be known throughout this paper as T1, T2, and T3; and
3. Observe the academics and their students using the DILE.

How is the space used?
The unique aspect of the Deakin Immersive Learning Environment is the variety of settings within one classroom. The main features of the studio were observed being used in the following ways:

Board table
The boardroom table was a place to start a class, for the whole group to meet together and discuss the preceding lecture and/or the activities to be undertaken during that class. It was observed as a place where small groups can meet to discuss and work, as well as a place for student groups to present to each other towards the end of the timetabled class. It is a setting that facilitates many different activities as was initially intended.

Lounge
The lounge was not heavily utilised during the observations, but its colour and form did break up the formality of the classroom. One class being observed was small enough for the whole class to meet around the lounge setting, which was perceived as more intimate setting and appeared to generate a more fluid group discussion. In this
instance the tutor moved around continuously in the background drawing students into the conversation. Teachers discussed this setting with positivity, particularly in their reflections of students using the feature. Although the observations did not verify its extent of use, the lounge does appear to evoke a sense of informality and creativity to the studio.

High tables

The high tables were intended to be used by small groups in a standing position, with or without a laptop. There were no observations of teachers or students using the high tables, although there was evidence that they were being moved around. The general consensus among the academics interviewed was that the high tables are not of great value in supporting their teaching approach.

Presentation desk

The presentation desk is generally loathed by the teachers, who believe it creates a hierarchy between teacher and student, and promotes a teacher-centred approach. One event was observed whereby a group of students presented to the class from the presentation desk, but the general perception from academic staff is that it is a barrier and counterintuitive to the educational intentions of the classroom.

Fixed computer bench

While educational technology in the studio is understated, it is nonetheless important. As anticipated during design, access to computers was to be on the fringe of student activities: available when required. However, the fixed computers and bench contained the highest degree of activity of all the studio features. Group discussion and problem-solving was certainly in evidence, but computers appeared to be accessed as part of the problem-solving process.

Different use between year levels

There was a notable difference in use of the studio between first year and third year students. This appears to be as a result of differing pedagogical approaches for each cohort. First year students need to learn to work collaboratively. T2’s approach is to “set them little mini projects in each studio. They have to complete something in each studio as a group… [in] first semester, they’re all coming from secondary school where they’ve been all doing things individually and moving straight into teamwork is like: no, I find I have to warm them up quite a bit and get them used to it…In the next semester it’s all group work; it’s all focused on doing studio stuff together; all of the assignment work is teamwork as well.”

By third year, as T3 explains, “we expect students to have already picked up the skills and knowledge in second year, and to now apply that knowledge and some project management skills in this unit. So my role really is to act as a mentor, and as an adviser and just help them go through the paces. Not to engage with them and teach them new things. So it’s very much an independent unit.” In this scenario the studio is a place to meet as a small group to work on a project, to discuss their project with their tutor, get briefed on the project at the beginning of the semester and present to the class at the end of the semester.

During the observations, four categories of activity were evident: activities that were solely teacher directed (i.e. mini lecture), activities that were teacher-led, but included discussion and interaction with students, activities that students undertook collaboratively, and student presentations to the whole class. These categories are represented in the following diagram (Figure 6) and begin to tell the story of what teaching and learning looks like in the studio.

How is technology used?

The studio is a relatively low-technology space, with teacher-operated equipment and four computers shared between students. The budget did not extend to designing educational technology systems specifically to suit collaborative learning. Therefore, the audiovisual strategy was to fit out the studio with equipment and technology that was the same as every general teaching space in the university. This was not only a budget-driven decision, but also a risk strategy developed by management in case the DILE needed to be transformed back to a general teaching space in the future.

The studio is part of the Deakin wireless network, encouraging students to bring in their own laptops. Anecdotally this occurs more frequently at third year level, but there was little evidence of first year students bringing their own laptops.

The computers were initially anticipated to be used by individuals, but in reality the majority of observations of the computers in use involved group collaborations of up to five people. Students were often crammed around one monitor as the distance between computers was estimated to be less than one metre (refer figure 7). Some students were observed “hanging back” from the group, not engaging in the learning activity. The quantity of students condensed into one part of the studio also appeared to make it difficult for the teacher to move around and talk to each group. T1’s contention that 95 percent of collaborative work would be away from the computer was not supported by the observations.

How was the facility evaluated?

Zimring and Reizenstein (1980) broadly define post occupancy evaluation as “an examination of the effectiveness for human users of occupied design environments”. Lackney (2001) more specifically discusses post occupancy evaluation in the context of educational adequacy, where
the evaluation focuses on the “degree to which the building supports the goals of the educational process”. A review of building evaluation and data collection methods revealed a variety of examples from simple question and response templates, to rigorous qualitative analysis methods employed in the field of environmental psychology (Sanoff, Christie, Tester, & Vaupel, 2006; Zimmerman & Martin, 2001; C. Zimring & Rosenheck, 2001).

Relating to approaches embedded in environmental psychology research, the methods of collecting data for this research project were determined to include semi-structured interviews (Kvale, 1996) and passive observations (Sanoff et al., 2006). Interview questions were prepared to cover topics related specifically to each participant’s role. Topics for discussion included design and procurement processes prior to occupancy, the briefing process and how pedagogy was considered in the design phases, how teachers approached teaching and learning with the learning environment in mind, and the physical features and qualities of each space. The observational study was approached as an opportunity to track human movement throughout the space, to see how both teachers and students interacted with the physical classroom features.

How to measure?

There is no doubt that collaborative learning occurs in the studio. But is the collaborative learning studio a success? How should success be measured? The Space Allocation Manager raised the issue that ‘utilisation rates’ for the studio were below expectations. ‘Utilisation’ is the facility manager’s measure of how often a classroom is being used and how many people are using the space (AAPPA, 2002). It does not consider what the students are doing and for what educational purpose; utilisation does not measure learning outcomes or effectiveness. Access to the studio for timetabled classes has been limited to learning outcomes or effectiveness. Access to the educational purpose; utilisation does not measure what the students are doing and for what educational purpose it serves. The studio has attracted little publicity across the university or professional development for teachers to learn how to use the classroom. These issues do not impact directly on the design of the studio, but have a significant bearing on the perceived success of the facility.

The teachers interviewed expressed unanimous support for the studio and collaborative learning. The studio has enabled the teachers to practice teaching in ways that encourage students to engage deeply with the curriculum and importantly, with other students.

T3: I think just in the structure of the room... it probably allows me to engage more with the students than in a normal tutorial room or in a prac room [computer laboratory]... In this space, it has allowed me to... have a better relationship with the students.

T2: I like it. I think it’s a really good way of teaching. I don’t think it’s suitable for everything. But it’s suitable for a great many things, a great many units. I think it’s very conducive for learning and teaching.

The key features of the classroom allow a range of learning activities to occur simultaneously, empowering students to determine for them how to complete the tasks set by the teacher. Consequently, the facility does achieve its major objective as a place for collaborative learning and in this sense enables good teaching and learning practice to occur.

The collaborative learning studio is not a state-of-the-art facility in terms of educational technology, and demonstrates that innovative learning environments do not have to be technology-rich in order for good teaching and learning practice to occur. However, T1 expressed that it would have been desirable to explore educational technologies that were aligned with collaborative learning, but the limited budget did not enable that to occur.

The studio could be utilised more by promoting it as a place for collaborative learning to the broader university community, through publicity, special events and professional development. Promotional activities enable community stakeholders to take an interest in alternative teaching and learning practices and seek opportunities to participate in professional development programs.

The Deakin University Immersive Learning Environment is a clear example of a ‘new generation learning environment’, which the author defines as a classroom that has been designed in response to a specific pedagogy and to support a more student-centred approach to teaching and learning.

As a result of the findings from the case study, the author proposes a preliminary framework for cultivating future New Generation Learning Environments. This framework is intended to assist institutions manage the design and procurement processes involved with new educational facilities.
A framework for developing New Generation Learning Environments

1. The briefing process should explicitly state the educational vision of the proposed facility and anticipate the range of teaching and learning activities that may take place. This vision should come from academics likely to teach in the space.

2. The design phase is a highly consultative process that includes academics likely to teach in the facility, and enables confirmation of the brief.

3. Educational technology to enhance teaching and learning should be considered and incorporated in both the briefing and design phases.

4. The resultant design is the product of a partnership between the facility manager, the architect, the information technology manager and academics teaching in the space.

5. The anticipated pedagogy underpins all design decisions.

6. Professional development should be implemented to allow teachers to discover the teaching and learning potential of the facility, and adapt their practice if necessary.

7. The institution should publicise the new facility as a means of promoting good teaching and learning practice, across the university.

Figure 7: First year class 2:15pm, 20th March 2007. Dane

Figure 7: All students dispersed in their groups and commenced the planned task. The teacher moved around room discussing the activity with each group as needed. It was noticeably difficult for the teacher to access Group 3. The task involved students creating an audio recording, so Group 1 moved to the lounge to record some sounds, before relocating to the presentation desk to continue task. There was significant interaction between groups as they could hear the production of each groups’ sounds. Duration of activities in this setting 45 minutes.
Acknowledgements

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References


5.5 Supporting Teaching and Learning through the Intelligent Design of Learning Support Spaces: A Griffith University Example

What is it?

For a number of years, universities in Australia have rung with the sound of the construction of new buildings or the refurbishment of old or dysfunctional spaces. Driven by a range of factors that include increasing student enrolments, the ageing cycle of existing stock or just a general strength in the economy, many universities are looking to modernise or develop their buildings and spaces.

Con Graves, Elaina Berg
Griffith University, Australia

In 2004, Griffith University in Brisbane, Australia, started on a process of reinvigorating library spaces. Following some experimentation, it was decided to refurbish spaces to reflect the major components of intellectual activity including quiet research, group work, multimedia work and presentation preparation. While it could be argued that this thinking is becoming increasingly common in many library spaces, the Griffith refurbishment considered this change in the context of three frameworks when thinking about users and their space. These included:

(i) Principles espoused by Jamieson, Dane and Lippman, (2005) for development of on-campus teaching and learning facilities;
(ii) The characteristics of modern students that influence our learning spaces as articulated by Lomas and Oblinger (2006); and
(iii) Key characteristics of well-designed architectural space that enhance ambience and shape behaviour.

Principles for the Built Campus Environment

Jamieson et al. (2000) proposed a set of principles for designing built environments. These principles were "based on an emergent idea of student centred, flexible learning … [and were] … intended to result in facilities which are less prescribed and function-specific than is presently the case. Their application is intended to foster a sense of ownership by individual communities created through the use and occupation of specific locations on-campus." (Jamieson et al., 2000, p.227) These principles included:

• Design space for multiple uses concurrently and consecutively.
• Design to maximise the inherent flexibility within each space.
• Design to make use of the vertical dimension of facilities.
• Design to integrate previously discrete campus functions.
• Design features and functions to maximise teacher and student control.
• Design to maximise alignment of different curricula activities.

Why is it?

Changes in pedagogy have also influenced changes in the physical infrastructure of learning spaces and buildings. Pedagogy has moved a long way from the traditional ‘chalk and talk’ approach to embrace a variety of teaching methodologies and practices. For example, most curricula, certainly at a post-graduate level but increasingly at an undergraduate level, now incorporates a variety of teaching and assessment approaches that include inter alia; formal lectures, group work, practical demonstrations, student delivered presentations and multi-media content. These approaches to teaching and assessment may be delivered in formal classrooms, laboratories, tutorial/seminar rooms and in some cases are blended in the physical and virtual environment. In order for these approaches to be effective, some thought needs to be given to the design of both the delivery spaces and the environments students and staff may use to prepare for these activities.

While significant attention has been devoted to the delivery spaces, there is increasing interest being devoted to spaces that support the learning endeavours such as libraries and computing labs. This paper will describe an attempt by Griffith to develop the Library space as a support space for student and academic approach to learning. It will discuss some of the frameworks utilised for development and evaluation of this space.
What happens here?

Student Characteristics

Lomas and Oblinger (2006, p.5.2) have identified “five...[student] characteristics...[that]...seemed particularly applicable for learning spaces”. These characteristics include:

- Digital: adopting digital technology to engage with the world for both work and pleasure.
- Mobile: using a range of devices to bring their preferred digital environments to campus with them.
- Independent: “individuals surf the Internet to uncover facts, chase down links of interest, and then aggregate and synthesise information. This self reliance reveals that many of today’s students are self-directed, internally motivated, and inquisitive.” (2006 p.5.2)
- Social: students are comfortable to engage in loosely formed groups that change as their needs change.
- Participatory: students often engage in using a range of communication technologies and mediums to contribute to corporate good. Examples of this may include blogs, social networking websites (such has Flickr, Facebook and mySpace).

How is the Space Used?

Our final framework was based on a distillation of literature in architecture, design, social psychology, psychiatry and marketing and promotion. From our reading, we believe the dominant factors that needed to be considered in maximising the ambience or shaping learning behaviour in any space would include:

- Maximising natural light -- ensuring all spaces that are to be used for any length of time have as much ambient, natural light as possible.
- Bringing the outside in -- related to light, Griffith has significant natural bush assets, so attempts were made to engage the users of the space with the outside natural surroundings.
- Zoning of activity -- using zoning to identify behaviours or activities appropriate to the space (e.g. quiet zones, mobile friendly zones, noisy zones etc).
- Declaration of function -- the notion that a student could identify behaviour appropriate to the space as they approach it from the outside rather than relying on signs to inform or influence their behaviour.
- Use of colour -- using a range of colours in spaces to influence the mood and/or behaviour of the users in the space.
- Use of textures and materials -- to control sound, lighting and to give tactile feedback.
- Using familiar objects (or props) to establish standards of behaviour or use -- e.g. having lounges and bean bags in more casual areas and study carrels in quiet study areas.
- Flexibility of function to allow spaces to change and adapt to different uses dependent on the time of the semester or group that was using the space.
- Providing technology to support a range of behaviours in the environment -- ensuring access to necessities to allow students to maximise the use of the environment including wireless network, power, whiteboards, A. M. X. panels etc.
The Griffith Zones

Using these frameworks Griffith has built a range of formal and informal zones in its libraries. The three formal zones include a ‘Collaboration Zone’, a ‘Research Zone’ and a ‘Learning Zone’.

Collaboration Zone
Firstly, this zone is designed as the space for users to congregate in groups to collaborate on work, study or projects, or just to meet in preparation to go elsewhere as their work/study/learning needs dictate. This zone contains a mixture of seating, including beanbags, wheeled chairs, light movable chairs, tables and whiteboards and lounge furniture. This furniture can be moved to facilitate the formation of transient groups and activities. In addition, these zones contain DVD players and large flat panel screens where students and staff can watch DVDs for coursework or research or other significant events such as the recent Olympics. This space is often noisy and filled with undergraduate and postgraduate student users. Users in this area are more likely to be a younger population (Gen X or Gen Y).

Research Zone
Secondly, this space is designed as a more traditional library space for users who wish to use more specialised equipment (such as microfiche on microfilm), non-networked databases (such as early CD ROM based ABS statistics or specialist databases) or library reference materials. This zone contains more fixed furniture and larger desks (to allow clients to spread materials out), and more single workspaces. It is a quiet study area and is inhabited more frequently by postgraduate students or more mature students and staff.

Learning Zone
Thirdly, this zone is designed to provide an easier interface between students and library teaching and support staff (such as Learning Advisors and Computer or Information Literacy Specialists). This space contains a mixture of study booths that will seat up to eight people, larger four person movable tables and presentation practice rooms. Along the sides of this zone are the offices for library teaching staff and more specialised training rooms (including dedicated training computer labs). This space is not intended to only be used by students who wish to see our staff but it is attractive to students waiting for workshops or individual appointments. This space encourages quiet conversations not noisy interactions. During SWAT and exam periods this area becomes a silent study zone.

Informal Zones
The informal zones include our library collections area and a quiet study zone.

Collections Area and Quiet Study Zone
Griffith has also standardised some features of its library layouts. In our multi-floor libraries, we have separated the noisy areas (including Collaboration Zone, entrances and print areas) from the quiet areas (such as collections and quiet, individual study spaces). On all three campuses where we have multi-story buildings, the entrance floor is a
Table 1. (Jamieson *et al.*, 2000, 231-232) Space Design Principles Evaluation.

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<th>Principle</th>
<th>Provision for and some early experiences with refurbished library spaces</th>
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<tr>
<td>1. Design space for multiple uses concurrently and consecutively.</td>
<td>Provision: spaces should be able to be adapted to fit the needs of multiple student groups to support their learning styles. Experience: The furniture, props and zoning of spaces allow students to arrange the study space, according to the individual or group’s needs. Students are able to assemble tables/chairs/beanbags/two-way whiteboards to meet their preferred approach to practice in the collaboration and learning zones. The Library, more generally provides spaces that allow for a range of study modes, including quiet study, collection and quiet zone, Research (Research Zone), and group work (Collaboration, Zone). A significant number of loan laptops have been made available in the many of the libraries.</td>
</tr>
<tr>
<td>2. Design to maximise the inherent flexibility within each space.</td>
<td>Provision: Learning and Research zones contain a range of movable chairs/tables/beanbags/whiteboards that maximise flexibility. Experience: As indicated in Principle 1, students can manipulate props to fit appropriate study styles. During different parts of the semester, students may move furniture to allow for larger study groups and projects, while during SWAT, they may form small study cells.</td>
</tr>
<tr>
<td>3. Design to make use of vertical dimension in facilities.</td>
<td>Provision: where possible, walls have been used to extend the workable space by a flat screen monitors, whiteboards and data projected images. Experience: whiteboards and flat screen TV monitors have been used extensively for both study person purposes, entertainment (screening Olympics) and messaging by students.</td>
</tr>
<tr>
<td>4. Design to integrate previously discreet campus functions.</td>
<td>Provision: multimedia content developed for a range of university services are played on flat screen panels in the Library. Experience: the university services are played on the library flat-screen panels. An evaluation of the impact of promotion of services will be conducted in early 2009.</td>
</tr>
<tr>
<td>5. Design features and functions to maximise teacher/student control.</td>
<td>Provision: Spaces are made available for the library user to adapt to meet their needs. Props are portable where possible and users are given access to control electronic equipment in the environment. Experience: Users move furniture and other props around the Library. Extensive use is made of whiteboard spaces and flat panels are used with limited staff intervention.</td>
</tr>
<tr>
<td>6. Design to maximise alignment of different curricula activities.</td>
<td>Provision: All refurbished libraries have space to support aspects of academic activity including research, group work, individual study and multi-media work. Experience: All refurbished libraries have spaces for group collaboration, multi-media computer labs, a quiet research area and individual study. Our most recently refurbished library at the Gold Coast has a presentation practice area.</td>
</tr>
<tr>
<td>7. Design to maximise student access to, use and ownership of, the environment.</td>
<td>Provision: All areas are available for the students to use and manage themselves. Experience: Students are able to use any of the areas set aside for their use at any time the Library is open.</td>
</tr>
</tbody>
</table>
### Table 2. Student Characteristics and how our library spaces support them. (Adapted from: Lomas and Oblinger’s 2006 p.5.2)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Provision for support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital.</td>
<td>All Griffith libraries have ubiquitous wireless access, good mobile phone coverage, and computing labs to allow students to be constantly connected to access material for both study and personal interest.</td>
</tr>
<tr>
<td>Mobile.</td>
<td>All refurbished libraries in addition to the above facilities have free laptop loans available for students as well as a significant number of power outlets to keep devices charged.</td>
</tr>
<tr>
<td>Independent.</td>
<td>All libraries offer courses and training programmes to support students develop an independent, self-regulated approach to learning.</td>
</tr>
<tr>
<td>Social.</td>
<td>The Collaboration Zone has been designed to allow a broad range of groups to function based on the student needs at different times of the semester.</td>
</tr>
<tr>
<td>Participatory.</td>
<td>As indicated above, extensive services have been implemented to allow for ubiquitous access to a broad range of work and social networking opportunities.</td>
</tr>
</tbody>
</table>

### Table 3. Dominant Factors designed to increase ambience of refurbished spaces.

<table>
<thead>
<tr>
<th>Dominant Factors</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Light.</td>
<td>All spaces/rooms have outside windows with natural light in at least some part of the space.</td>
</tr>
<tr>
<td>Outside In.</td>
<td>All spaces/rooms have outside windows that afford a view outside in at least some part of the space.</td>
</tr>
<tr>
<td>Zoning of Activity.</td>
<td>The Library has a range of zones that reflect each of the dominant activities of the curriculum.</td>
</tr>
<tr>
<td>Declaration of Function.</td>
<td>All areas afford an entrance area or a transition space outside the area that allows users to stop and observe the appropriate behaviour expected in the area. Limited numbers of signs exist to reinforce behaviours where necessary.</td>
</tr>
<tr>
<td>Use of Colour.</td>
<td>The Library has adopted a vibrant range of colours that vary between zones based on expected functions.</td>
</tr>
<tr>
<td>Textures and materials.</td>
<td>Textures and materials vary around the zones dependent on function. High pile carpet has been used in quiet areas to reduce noise of ambient traffic. There is a range of soft furnishings available to users based on availability and preference.</td>
</tr>
<tr>
<td>Familiar Props.</td>
<td>Large tables with multiple chairs have been used in areas where noise and collaboration is sanctioned. Specially designed seating, general power outlets and boutique tables have been installed in areas where high laptop use is expected. Single study booths and tables with limited chairs have been provided in areas where quiet study is expected.</td>
</tr>
<tr>
<td>Flexibility of Space.</td>
<td>See point 2 in Table 1.</td>
</tr>
<tr>
<td>Provide spaces to Support Technology.</td>
<td>The Library has ubiquitous wireless access. General power outlets have been installed extensively to recharge portable devices. Presentation practice rooms are equipped with technology consistent with their use.</td>
</tr>
</tbody>
</table>
noisy, mobile-friendly area while the upper floor is the collection, quiet study and mobile-free area.

Unlike other sections, this area is not specifically named but is dominated by the significant presence of our physical collection.

Evaluation of spaces against the principles

Using the framework adopted by Jamieson et al., 2000 Table 1 outlines how experiences align with the espoused principles.

Reflections on the Approach

The use of this simple, tabulated approach has helped Griffith to focus on some key driving principles in designing a space to support the teaching and research functions of the university. These frameworks were used extensively in our discussions with architects and builders and assisted in supporting our decision making processes as the “Design and Construct” process evolved. The frameworks enabled all those involved to understand the key principles and to have a common understanding of the design objectives of the space. We also believe it helped in clarifying to all parties the criteria we would use to judge the refurbishment a success.

Obviously these were not the only inputs to design and will not be the only criteria for evaluation. We also sought (and received extensive) input from students/Users (through the use of suggestion boards painted on walls in the refurbished library, a mySpace page and food for comment deals), and engaged a marketing researcher to undertake a qualitative study of student perceptions and desires prior to refurbishment. Following the refurbishment, we also intend to conduct student surveys and focus groups to solicit input on satisfaction, functionality and ambience. We are also proposing to undertake video surveillance and areas to assess use and observe user activity patterns.

Conclusion

In this paper we have described Griffith’s development of the Library space as a support space for student and academic work. The designing of the space was premised on supporting the key activities of teaching and learning in the university and informed by some key frameworks we used for development and evaluation of this space.

References


What it is?
The University of Newcastle’s next generation learning space is located in the Centre for Teaching and Learning (CTL) within the Auchmuty Library building of the University’s Callaghan campus. It is adjacent to the Auchmuty Information Common, a dynamic student space incorporating a café, computer facilities, photocopying facilities, and information desk. The CTL Seminar room is primarily accessed by academic and teaching staff at the University of Newcastle.

The educational technology infrastructure cost $43 500 and the cost of the refurbishment was approximately $25 000.

Consistent with the commitment to create an environment for promoting student-centred teaching, core elements of the workshop and seminar space are flexibility of seating and desk space and cutting edge educational e-technology for optimal interactivity and participant engagement. So, tables and chairs can be arranged in multiple ways and are easily moveable. E-technology includes an interactive whiteboard, data projector, videoconference screen and facilities, 20 laptops with wireless connectivity, and most importantly, Genesis™ interactive technology. The latter allows for maximum interactivity, among workshop participants, and between participants and workshop facilitators.

Why it is?
The Centre for Teaching and Learning (CTL) was established at the end of 2006 to assume a leadership role in learning and teaching at the University of Newcastle. Its mission included improving support for high quality teaching and learning across the following five core function areas: Teaching and Learning Support and Development, Educational Resources Support and Development, Learning Support, Teaching Spaces Support and Office of the Directorate.

Critical to the successful achievement of the Centre’s mission has been the design and development of its purpose-built spaces. The first, for Teaching and Learning Support and Development workshops and seminars, was designed in a way that would reflect and reinforce the University’s commitment to fostering an environment that promotes quality, collaborative learning through the application of principles of scholarly teaching and student-centred learning.

An important component of the CTL’s responsibilities is to develop and conduct workshops and courses that model, support and enhance teaching and learning for and with academic staff. Creating a technologically innovative and pedagogically sound seminar room for academic development had four core motivations:

1. To secure a purpose-designed space for academic staff development and support;
2. To provide a collaborative learning space for academics who facilitate the learning of students who use collaborative student learning spaces;
3. To resource the space with up to date equipment to support e-technology mediated teaching and learning; and
4. To provide opportunities for modelling best practice interactive learning experiences that can be transferred into the teaching of the participants’ students.

Additionally, this learning space, through the application of multimedia technologies, complements the following aims of the overall academic development program, that include:

1. Modelling activities that engage learners, particularly those that utilise interactive technology and facilitate collaborative or peer-based learning;
2. Providing programs at different levels of sophistication for academics with different levels of teaching experience;
3. Fostering scholarship of disciplinary teaching and learning; and
4. Evaluating the quality of learning using educational technology.

A significant aspect of the planning and development of the space was the collaboration and input from staff from the CTL, especially the teaching spaces support team, University architects, facilities management, and information technology. Importantly, the collaboration occurred from the outset. Traditionally, teaching spaces support teams (or their equivalent) are responsible only for the technical aspects of rooms such as lecture halls, tutorial rooms, and computer labs. Typically, their role is to ensure that the computer systems operate efficiently and are called upon to fix issues that arise when users of the technology have problems, such as
Lectopia™ not operating effectively. In the design of the CTL seminar room, however, this was not the case, with the teaching spaces support team involved in the planning from the initial stages.

From the outset, those with relevant expertise made decisions in either educational technologies or student-centred pedagogical practices. Importantly, the CTL, guided by information provided by the experts, was involved in the decision-making processes.

It is widely acknowledged that student group learning spaces incorporated in university library designs have become increasingly common in order to meet the learning needs of students (e.g. Bennett, 2006). Less common, however, are learning spaces specifically designed for the learning needs of academic staff. The CTL workshop and seminar room was deliberately designed as a dedicated space for academic development. Creating a space that enables meaningful social interactions and collaborations between participants in ways that encourage deep learning, was at the forefront of the design stages of this learning space.

Essentially, constructivist pedagogical principles informed the development of the CTL seminar room, with particular attention being paid to principles relevant to, or able to be modified for, high quality adult learning. They are Vygotsky’s social constructivism and Zone of Proximal Development (ZPD) (McInerney & McInerney, 2002), and an inquiry-based approach drawing on Dewey’s theories of constructing learning (Dewey, 1966). Both Vygotsky and Dewey are aligned philosophically and the theories mentioned here encourage active learning processes within social, or group, contexts.

What happens here?

The CTL Seminar Room provides a space for the facilitation of experiential learning in a higher education context that is grounded in recognised pedagogy theories combined with the use of innovative multimedia technology. The University has a strong commitment to high quality student-centred learning, and many of the participants at workshops are adult learners. Facilitation of sessions in this space are, therefore, characterised by active and reflective, group-based and collaborative inquiry-based experiences that are designed to promote deep and continued learning. Workshop participants are encouraged to reflect on the relevance and importance of these experiences for promoting high quality learning among the students they teach.

Educational technologies are integrated in academic workshops in ways that contribute to the enhancement of participant learning, rather than being used principally because the technology is available. This is one measure used to align pedagogy and workshop outcomes, ensuring that facilitators acknowledge that “Teaching is a scholarly activity and a life-long learning process with no single method or pedagogy that is most effective” (Ali, 2005, p. 243). This statement is taken with the view, in this context, that there are various ways to facilitate student-centred learning approaches in face-to-face learning contexts, both mediated through e-technology and not.

The pedagogical approach combined with the physical space encourages interaction between participants. In particular, sessions are based on the premise that participants will work with each other and facilitators on aspects of teaching and learning, rather than a didactic approach to teaching, which encourages passive learning, through an “…approach of transferring technical information…to students…” (Barraket, 2005, p. 67).

Figure 1. Participant logging in to Genesis™
These approaches are underpinned by the aim of the Teaching and Learning Support and Development team that is to support staff in taking a scholarly approach to teaching and learning. This approach is characterised by:

1. reflective practice, where teaching and learning is developed through: self reflection; peer review and feedback from colleagues; student feedback; and the scholarship of teaching and learning;
2. student-centred teaching;
3. teaching that engages students intellectually and develops their professional and practical capacities; and
4. engagement in open, critical dialogue about teaching and learning, and the exchange of ideas and strategies within and across disciplinary boundaries.

How is the space used?

The CTL seminar room is designed for seminar, forum and workshop-style events for up to 20 people. The space allows for maximum flexibility, particularly in the use of modularised furniture that can be configured in a variety of ways to suit the numbers of participants and the predetermined aims and outcomes of sessions.

There is a strong focus on modelling teaching and learning approaches that participants, who are typically academic staff with teaching responsibilities, can incorporate into their own teaching practice. In using the seminar room for academic development in the areas of enhancing teaching and learning skills for teaching academics, a principle of co-facilitating workshops between academics positioned in the CTL and faculty academics has been established. This way, the authenticity and relevance of the workshop by having a faculty academic as a co-facilitator, is enhanced.

Emphasis is placed on facilitating engaging activities that enable participants to examine their teaching and learning styles and activities that demonstrate collaborative learning activities. This approach also ensures best practice use of cutting edge educational technology, such as the wireless interactive technology of Genesis™ is modelled. Genesis™ is a classroom based teaching tool that enables participants to connect with each other and the facilitator through the use of laptops with wireless capabilities. Participants can communicate both one-on-one and through whole-class discussion.

How is technology used?

Combining educational technologies with student-centred pedagogical approaches used in order to present workshop content is an important aspect of workshop design and delivery. How pedagogies and educational technologies are combined and effectively integrated into workshops is explored here.

The initial conceptualisation of the learning space included a large focus on showcasing collaborative learning possibilities. Embedding the multi-media technologies in workshop planning has enabled this to be realised. As a result, learning activities take place which provide participants with a combination of interactive collaboration between participants, independent of the facilitator as well as collaboration between participants and facilitators. This is able to occur through the use of Genesis™. Figures 1 and 2
show Genesis™ being used by participants, with the guidance of a facilitator, in a collaborative learning workshop.

Vygotsky’s theory of social constructivism plays an important role in mediating learning between the pre-existing knowledge participants bring to workshops and the tools used in the workshop, such as Genesis™ and the interactive whiteboard. These tools are used in order to extend the learner's knowledge, rather than as a reinforcing tool or merely a superficial learning activity. In this way, the “tools” (for example, Genesis™) “…act as cognitive scaffolds that facilitate extension of knowledge into related areas” (McInerney & McInerney, 2002, p. 45). This transformative process has been successful in improving, amongst other things, the likelihood of participants to integrate learning technologies into their own teaching, as explained in the evaluation section below. Embedded within Vygotsky’s theory of social constructivism is the Zone of Proximal Development (ZPD) (Daniels, 2001; Newman & Holzman, 1993), and an aspect of student-centred learning that is applied in workshop facilitation. In this way, mediating between educational technologies and workshop content, the facilitator assists, or scaffolds, participants through individual problem solving to achieve higher knowledge “under… guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86 in Daniels, 2001, p. 57), in this case peers being fellow participants who may have had experiences in either the content or the tools being used to learn the content.

Social constructivism aligns with computer educational technology mediated learning, when the educational technology is seen as a tool to build on participants’ prior understanding and knowledge of a particular topic. In recent years, with the wide spread use of computer educational technologies, there has been an increase in the publications that link constructivism as a good practice pedagogy to use with computer mediated learning within higher education contexts (Laurillard, 2002). In applying pedagogical practices to learning with e-technologies, Rubin (1996) asserts that when “Technology is viewed as a tool…in the context of solving problems” it enables participants to assist one another. Whilst Rubin discusses this in the context of the mechanics of technology, this can also be applied to content understanding.

In selecting the educational technology for the seminar room, targeting facilities that were able to effectively incorporate interactivity resulting in heightened participant engagement was important. Consequently, interactive whiteboard, video conferencing and most importantly, Genesis™ technology were selected to be incorporated in the seminar room. The selected technologies are non-intrusive, though play an important role in facilitating workshops and other sessions held in the seminar room. As mentioned previously, sessions often utilise movable laptop computers that go online via wireless network. The network, Genesis™, enables virtual interactivity between participants and facilitator(s) and allows all participants to observe the work of each other and provide feedback as appropriate; and use of the interactive white board.

How was the facility evaluated?

The space is systematically evaluated as part of participant surveying, occurring at the end of each workshop or course. Unsolicited informal feedback provided by participants, such as through emails sent post-event, are also being collated to inform evaluation and future planning for both the use of this space and future learning spaces.

Specifically, the physical landscape of the environment is evaluated through the following type of questions (adapted depending on the workshop held) in the survey tool, with responses marked on a five-point Likert scale:

1. I rate the physical environment of the workshop (for the context of learning) as:
2. I rate the convenience of the location of this workshop as:
3. The infrastructure of the classroom (such as computer technologies) enhanced my learning experience:
4. The layout of the classroom (eg desks, chairs) was conducive to providing good learning opportunities:

The space is also evaluated informally, through feedback based on observations of workshops from CTL and faculty-based facilitators. For example, through observation of participant movement and comfort during a number of workshops, it was decided that the furniture selected was too large for the space available. As a result, the furniture initially used was moved to another workshop space, and furniture that fitted more ergonomically in the seminar room was brought in. This has resulted in a more comfortable workshop environment, enabling interactions between participants to continue in a heightened way, and in the way initially planned.

Evidence from participants, gained through surveys, indicates that the workshop space has been rated a success, determined by post-survey workshops conducted in particular when the educational technologies are incorporated within the workshop delivery and content.
The quality of the CTL collaborative learning space was rated on a five point scale from excellent to poor by participants of workshops facilitated by the CTL during Semester 1, 2008. As figure 3 shows, a majority of participants thought the physical environment and educational technology (e-infrastructure) was outstanding or very good. Another 22 percent (averaged result) thought that they were good.

Analysed participant data indicates that in workshops where Genesis™ is used, the e-interactive technology has enhanced the experience of participants, with 100 percent indicating they strongly agreed or agreed that their experience had been enhanced. 85 percent of participants indicated the use of Genesis™ enhanced learning opportunities for participants through the facilitation of content. Demonstrating the transformative impact that modelling effective use of e-technologies has, 80 percent of participants indicated that they would consider using Genesis™ to support teaching and learning in their courses.

Supporting the quantitative data, one participant commented that a workshop using Genesis™ technology was a positive experience, due to the “Interaction, looking at the work of others really helped me understand the subject much better” (anonymous participant, 29th May, 2008).

The main types of learning and teaching that occur in the seminar room are workshops and seminars for academic staff. These sessions are guided by the pedagogical approaches identified already in this paper. Data of the effectiveness of the physical space, content of workshops, activities conducted and use of e-technologies is gathered through formal surveys completed by participants at the conclusion of workshops, and also through observations and reflections of the facilitators of sessions.

In terms of comparison with intended usage, there is a clear alignment. The purpose of the space was to model student-centred approaches through workshops designed for academic and teaching staff. Survey data, as reported above, has demonstrated that this has occurred. Future plans for the use of the seminar room include teleconferencing with participants on multiple sites and to hold one-topic forums in the space. Both these endeavours will continue to promote and encourage collaborative learning as an important aspect of staff development activities at the CTL.

Overall, the space design and equipment has worked as planned. There were, however a number of minor problems that presented. For example, there was a plan to include couches and side tables, but the limited physical space of the seminar room prevented this from being actualised. As already detailed, changes in furniture were made as a result of using space and realising the desk configurations did not suit the desired workshop outcomes in a completely satisfactory way.

Problems to do with the use of Genesis™ presented themselves early in the delivery of workshops. It was realised that logging on in a consistent way presented a challenge to the facilitators, due to the number of steps needed to log onto the laptop, to the University server and to Genesis™ itself. Although these steps cannot be eliminated, focused training has enabled the process to be made clear and explicit to users of the technology. Ongoing issues with the University’s wireless capabilities, beyond the scope of the CTL, have presented difficulties in using Genesis™. For example, when wireless connectivity is not working in the library, this impacts the seminar room, resulting in Genesis™ not being available. This negatively impacts the intended learning of specific workshops. The University network is continuing to be improved. The e-technology problems have highlighted the need to have a backup plan and hard copy resources.

Genesis™ enables collaborative learning to take place in a way that can be modelled in a user-friendly way for both experienced and inexperienced e-technology users. Figure 4 shows Genesis™ being used during a workshop for participants to report to the whole workshop group outcomes from a set activity.

What were the main lessons learned?

The effectiveness of the interactive technologies has been more positive than expected both in terms of improving learning outcomes of participants and in the positive attitudes displayed by participants using e-technologies in a facilitated workshop. The success and learning benefits of using Genesis™ over other face-to-face activities when sharing detailed information between participants was realised when for one particular workshop, Genesis™ was unable to be used, due to technical difficulties. An activity that had worked exceptionally well through the mediation of Genesis™, did not work as well when participants did not have the facility to display and thus draw on explicitly and honestly on their responses to a set activity. As a result, conversations between participants and the facilitators did not develop as deeply as it had in previous workshops. In this case, the benefits of using Genesis™ were made evident, and have encouraged its continued and greater use in workshops.

Plans are currently being considered to implement this style of innovative use of teaching space, through interactive video conferencing, with satellite campuses in Ourimbah (NSW Central Coast), Port Macquarie and Singapore. Additionally, planning is currently underway for another innovative learning space, to be accessed primarily by students seeking to use Learning Support services. Experiences from the design and construction of the seminar room and facilitation of workshops have informed the planning of two new learning spaces used by the CTL. Aspects of the seminar room that need modification, or have been problematic, have been detailed throughout this paper.

The main advice relates to the planning and development of such a space and to the real value of having all expertise and experience involved from the outset. The CTL workshop space was truly a collaborative endeavour, involving people from facilities management, IT, AV, and teaching and learning. All decisions, therefore, benefitted from the expertise and experience of several key players.
Acknowledgements

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References


Learning in the Spaces: A Comparative Study of the Use of Traditional and ‘New Generation’ Library Learning Spaces by Various Disciplinary Cohorts

The University of Queensland Library comprises 14 service delivery branches and a number of service support units. During 2008 the Library undertook research into the use of library learning spaces. The research included a survey and a design workshop. The aim of the survey was to elicit information about what happened during one day at four of the branches: the Social Sciences and Humanities Library, the Dorothy Hill Physical Sciences and Engineering Library, the Biological Sciences Library and the UQ Ipswich Library. These libraries serve obvious disciplinary cohorts. Two of the libraries are products of ‘next generation’ design concepts and two await planned refurbishment. The design workshop was conducted with focus groups of students and was intended to delve deeper into student requirements of our spaces and to find out what, to the students, represents an ‘ideal’ space that would support them in various learning activities.

The research focused on student use of library learning spaces to gather information about how students interact with one another, with technology, and with library learning spaces in their pursuit of learning outcomes. There were two parts to the research: a survey in which students were asked to provide information about their use of the library and a design workshop, where student focus groups brainstormed their ideal space to support different learning activities. One research objective was to gather information about how actual use of space compares with intended use. Another aim was to explore how student use of space relates the learning or research activity being undertaken: do students undertake self-directed work in quiet spaces and group work in active spaces and how is technology used to support these activities?

The Research

On 12 August, surveys were distributed to students using four UQ Library branches. The surveys had three elements: a series of questions about the student’s intentions (what were they coming to the library to do?); a floor plan on which they marked their movements and activities during their visit; and a series of exit questions to assess the success of their visit (had they achieved their intentions?). In excess of 1500 responses were returned. Results show that students are intentional about their use of library spaces and services: they schedule their visit into their day; they appreciate how much time they have to spend and what they need to achieve in that time; they know what spaces and services are available and are purposeful about where they go to work in the library according to their current task; and they expect to complete what they have to do. Students use the various types of spaces provided in the library intelligently.

A design workshop was held during the week following the survey. Groups of students ‘designed’ their preferred learning space for three academic scenarios: collaborative group work; an individually assessed piece of course work; and examination preparation. While each group had its preferences, a number of common themes emerged. These included reliable and widespread access to the Internet; a range of technology to support group work including voice recorders, smart boards and printers; a steady supply of drinking water and coffee; and adequate natural light. Services that provide convenience are valued. The students affirmed that place is important to them: they like to come to the library. They also confirmed what we know from observation: student demands of spaces change during the academic year according to course progression and the nature of the assessment tasks on which they are working. So flexibility is an important design consideration.

‘My Time at UQ Library’ Survey

A survey was carried out during the course of an entire day from opening to closing in four branches of the UQ Library: the Social Sciences and Humanities Library and the Dorothy Hill Physical Sciences and Engineering Library, both of which have been identified for future refurbishment, and the UQ Ipswich Library and the Biological Sciences Library, two ‘next generation’ learning spaces.

Type of data collected

The survey was anonymous and only basic demographic data was collected. The time of entry and exit was collected to establish hours of use. Information about student intentions for their use of the space was collected: what had they come to the library to do; why had they come to the library to do this; where were they before; how long did they plan to stay there on that visit; where in the library did they plan to work; was that their only visit to the branch on that day; and how often did they usually visit, in person, that branch/any UQ Library/non UQ libraries.

Students were asked to mark the sequence of their activities on a floor plan of the branch and include comments about what activities they did and how long they spent on each activity.

Students were also asked ‘exit questions’: what had they actually done on this visit; what else beyond their original intent had they done and why; what more could the library provide to support them in their studies; had they spent as much time as they had intended on this visit, and if not why; and where were they going next?
Number of respondents
Completed surveys numbered 1532 with the following breakdown: Social Sciences and Humanities Library: 492 (10 percent of the branch gate figures that day); Dorothy Hill Physical Sciences and Engineering Library: 405 (19 percent of gate figures); UQ Ipswich Library: 149 (23 percent of gate figures); and Biological Sciences Library: 486 (16.7 percent of gate figures).

Results and preliminary discussion
1. Most respondents visited the library to undertake individual study-related activities and they accomplished this.

Most students (63.11 percent of all respondents) came to the library in order to use a computer/laptop. Other popular reasons for coming to the library were, in ranked order, to undertake quiet study, find or borrow books, work on an individual assignment, use a printer or photocopier, and find journal articles. That is, the top five reasons for visiting the library are individual activities.

2. Respondents also visited the library to undertake social or group learning activities

Students also came to the library to undertake group work or meet friends. Using services provided in person by library staff, was not identified by most students as their main reason for visiting the library. The lowest rated reasons why students were coming to the library were to get research help, attend a training session, and get IT help.

Branch data mirrored that data obtained from all respondents, with only slight variations. For example in the Social Sciences and Humanities Library the most quoted reason for visiting was to undertake quiet study, followed by computer use. Data obtained from postgraduate respondents also fit the pattern however they were more likely than other students to come to the library to seek assistance from library staff.

3. In all but a few instances, respondents actually did less of what they had intended to do.

The exception to this was students in the ‘next generation’ libraries where more worked at computers than had intended. It seems that students met friends or had other reasons to distract them. In all libraries fewer students achieved quiet study than had intended to, with the greatest variation being in the yet-to-be-refurbished Dorothy Hill Physical Sciences and Engineering Library. Students in this library also did less work on an individual assignment, made less use of printers/photocopiers, and did less group work than they had intended.

Students at the UQ Ipswich Library and Social Sciences and Humanities Library were least likely to be successful in finding/borrowing books than students using the other branches. These libraries contain collections that support the arts, social sciences and humanities disciplines. These disciplines tend to still be more reliant on print materials than electronic, vis-à-vis the sciences. Students in the Social Sciences and Humanities Library were also least likely to be successful in finding journal articles. The postgraduate cohort across all libraries recorded the highest failure rate for finding journals.

Students in the Social Sciences and Humanities Library had most difficulty finding course materials and also had the highest failure rate in using the High Use collection.

In all libraries, fewer used their own laptops than had intended, with the greatest variance being in the Social Sciences and Humanities Library.

In all libraries, students met more friends than intended, except at the Dorothy Hill Physical Sciences and Engineering Library.

In all but a few instances, respondents actually did more ‘other’ things than they had intended to do.

Everyone except Social Sciences and Humanities Library users did more of ‘other’ things than they had intended. Fewer got research help than had intended (and those numbers were small), likewise IT help.
5. Most respondents chose to work in the library because it is conveniently located and provides good study spaces. The highest cited reasons why students chose to undertake their activities in the library were: convenient location (50.9 percent of all respondents); good study/working spaces; good study atmosphere; and it was the only place to find what they needed. This was consistent across the branches surveyed. Convenient location was the top reason for all respondents and all libraries except the newer UQ Ipswich Library, where 'good study/working spaces' ranked first, with 'good study atmosphere' a close second.

6. All cohorts put location, atmosphere, study space, and finding what they need above the social reasons (group meeting or meeting friends).

Most of the students who attributed their visit to the library to the fact that their group was meeting there were using the UQ Ipswich Library. This was followed by the Dorothy Hill Physical Sciences and Engineering Library, the Social Sciences and Humanities Library, and finally the Biological Sciences Library. These results may be outcome of the availability of alternative group working sites within reasonable proximity.

Most of the students visiting the Social Sciences and Humanities Library went there because it was the only place to find what they needed. This was followed in order by the UQ Ipswich, the Biological Sciences Library and finally, the Dorothy Hill Physical Sciences and Engineering Library. This is a not surprising outcome, given that the two former libraries serve the humanities and social sciences disciplines that are still more print-reliant than the science, medicine and technology disciplines served by the other two libraries.
7. Most respondents visited the library after they had been at home or at a class.

8. Most respondents planned to stay in the library for between 30 minutes and two hours.
   Around a third of students (32.69 percent) planned only a quick visit (less than 30 minutes) and 22.61 percent planned to stay for longer than two hours.

9. Respondents were regular library visitors.
   Most respondents (58 percent) said they visit a UQ Library daily, and 42 percent of them visited more than once on the survey day. Many visit at least weekly and only 5 percent responded that they visited infrequently (less than monthly). In addition, 30 percent of respondents visit non-UQ libraries at least once a month. Social Sciences and Humanities Library respondents (at 48 percent) and postgraduates (at 43 percent) are less likely to be daily visitors to the library than other cohorts.

10. Students spent most of their time in the library using computers and quiet study spaces.
    Computers are the most used facility in the library: 25 percent of respondents spent 53 percent of their time using a library computer/laptop. After computers, students made use of the quiet study carrels in the library: 11.8 percent of respondents spent 53 percent of their time using this facility (students also used laptops in quiet study carrels). The next area most used was the group study rooms/tables: 7.67 percent of students spent 28 percent of their time in group areas. The information desk, Ask IT desk, and loans desk together were cited as areas used by just 7.54 percent of individuals, who spent 2.5 percent of their time here on the survey day.

11. Students also used email in the library, used the Internet, met or chatted with their friends, ate, borrowed books, and used Facebook.

12. Students wanted the library to provide more computers and more quiet areas.
    There were 771 responses to the question about whether library could do more to support them in their studies. One student wrote 'More computers. Sometimes it is quite difficult to find somewhere to study (with a computer), if you come during the day. Need to be here by 9am to get a study spot with a computer.' Another said 'The library is great except for all the other students.' Students wanted the library to enforce quiet in designated areas and objected to other students talking loudly on mobile phones. These results are consistent with the outcomes of client surveys.

Design workshop

The survey was followed a week later with a two-hour design workshop. Incentives to participate were offered. Eighteen students participated and were divided into three groups. The students were undergraduates and postgraduates, and enrolled in different programs. Completion of the space use
survey was not a prerequisite but was mentioned to set the scene.

The flexible learning space setting – the Collaborative Teaching and Learning Centre (CTLC) – supported the use of instruction, collaboration, and reporting.

The student experience was critical and the workshop aim was to tease out ‘the ideal’ for students. Three scenarios were put to the groups who brainstormed the ideal space that would support them best in that learning activity.

1. **What resources and space are desired for group work?**

Groups were asked to imagine that they had been set an assignment that required collaboration with other students. Interestingly, groups thought of this in terms of working together physically.

To support this activity, students wanted bookable, swipe card accessible study rooms fitted with plasma screens or projectors. Rooms should be spacious and soundproof, and students wanted privacy but at the same time valued a view to the outside world. Students expressed a preference for working in rooms rather than in open areas.

Students liked the group rooms in the Biological Sciences Library, which include technology that supports cooperative group work: plasma screens to which laptops can be connected allow multiple group members to view an assignment and whiteboard walls allow students to map concepts and write notes. They said they wanted rooms to contain whiteboards with inbuilt printers or ‘smart boards’ to capture and facilitate the sharing of electronic content, and printers/scanners.

Students wanted access to multiple computers and power points, as well as Internet and wireless access for laptops and mobile devices.

Spaces that simulate the presentation environment and allow students to rehearse presentations were desirable. These spaces would provide the appropriate technology, including voice recorders.

Alternatives to fluorescent lighting were proposed: natural light or adjustable lighting/lamps perhaps.

Tables should be large, to provide space to spread out, read, and work at a computer. Chairs should be comfortable and height adjustable. Students expressed a desire to be allowed to eat and drink while they worked, and requested more water fountains. If students had access to a space that met their needs, then they would prefer to remain there.

2. **What resources and space are desired for individual assignment work?**

Students expressed a preference for working in an enclosed private space and requested bookable, swipe card accessible, sound-proof rooms. This is consistent with results from client surveys: students would like 24 hour, swipe card access to study spaces. Security was a consideration.

Students wanted lockable rooms or lockable desks so they could leave their belongings
Many of the students wanted libraries to be separated spaces and suggested social spaces in the library should be separately located. They also wanted printers, copiers, and recharge machines to be isolated to contain noise.

Again students expressed a preference for large tables that provided space to spread out books and work at a computer (students are regularly observed working on the floor with their laptop and books spread out around them.) They repeated the desire for alternatives to fluorescent lighting.

3. What resources and spaces are desired when preparing for exams?

Students valued a ‘soothing environment’. They wanted to be able to study in comfortable, attractive spaces with natural light and fresh air if possible. They also wanted minimal distractions.

When studying for exams, they wanted access to individual study rooms that were bookable (for entire days) and fitted out with whiteboards. They would prefer tables bigger than current library carrels so they could spread out textbooks and notebooks. Security was raised again. A suggested alternative to rooms was the concept of lockable desks so items could be left safely if students wanted to get up for a break.

Comfortable chairs were also appreciated.

Students wanted easy access to things to help them study and make good use of their time, like stationery vending machines and fast printing facilities. They wanted water fountains on each level of the library and permission to eat and drink (the survey found that having to leave the library in order to eat/get a coffee meant that students ‘lost their place’, and it was one reason why they did not stay as long as they had intended.

Students wanted minimal distractions.

Students wanted easy access to things to help them study and make good use of their time, like stationery vending machines and fast printing facilities. They wanted water fountains on each level of the library and permission to eat and drink while studying (they also requested that more bins be provided). The survey found that having to leave the library in order to eat/get a coffee meant that students ‘lost their place’, and it was one reason why they did not stay as long as they had intended.

Students wanted to find communal areas in the library where they could take a study break, relax, and socialise. In these areas they would like bean-bags, comfortable couches, free lockers for storage and free tea and coffee.

Students were aware that their demands of spaces vary during the course of the academic year. They felt that access to computers was not as important at exam time as it was at other times during semester. At exam time students wanted more online textbooks and semester loans and wanted the library to move more textbooks into the High Use area around exam time. They wanted past exam papers within reach and extended opening hours – to midnight, or 24-hour access.

Conclusions

Place is important. Despite wanting online access to journals, books, forums, and help, students like to come to the library. While students want online access to materials, forums that provided engagement with other students and lecturers, and even support such as the library’s online chat service, results from the design workshop were that staff support available in person in the library and having their ‘own space’ within the University were all valued aspects of the library as place.

Flexibility in spaces is important. Students acknowledged that their need for space differs during semester. This reinforces the need for libraries to think about flexible designs that accommodate needs at various times of the year.

Convenience is valued by students. Students are busy and the more we can do to provide convenient access and desirable spaces, the better their experience is likely to be. Things like easy access to water fountains, multiple access points to libraries, toilets on every level, and permission to eat and drink – all help to optimise their time in the library.

The information obtained from the research into student use of library and learning spaces will be considered along with the results of library surveys when developing spaces to suit learning needs.
The Hawthorn Project Hub at Swinburne University of Technology

What it is?
The Hawthorn Project Hub is located within the Hawthorn Campus of Swinburne University of Technology in Melbourne, Australia. It occupies approximately 1,000sqm in a former basement car park. It has direct access to the library ‘Late Lab’. The overall budget for the project was $2.5m.

Why it is?
Over 2006 and 2007, research was undertaken with students to gain a better understanding of group project experiences at Swinburne. Findings from this research included a strong indication that space for project teams to meet was the single most important thing we could do to improve their experience. This was more important overall than curricula or pedagogical changes. Students and academics also reported a strongly positive sense of community, ownership and commitment to their work in those cases where dedicated project spaces were available. It became clear that the physical environment had a significant impact on team and project experiences.

Over the first half of 2008, a team from the Swinburne Professional Learning Unit and Facilities and Services has been working to design the Hub. A reference group including students, academics, management and services departments has provided a means of multidirectional communication about the process and product requirements of a project-based curriculum, and the characteristics of a project-oriented campus space. The most critical decisions have been around how we develop a space that fosters independence and accommodates the needs of student project work. Along the way, the design team have been responsible for the final decisions on how the space is developed. However, in every case, the reference group has been consulted and asked for feedback as the plans have evolved. In the latter stages, dealing with the detail of access, policies, promotion and support has fallen to a management group. The group continues to use the input of stakeholders from across the institution for decision-making.

In tertiary education over recent years there has been a shift towards constructivist approaches to learning and teaching that emphasise active, collaborative, peer and social learning (Brown, 2005; Lee, 2006). Reflecting this shift, a key feature of the Swinburne Professional Learning model is that from 2009 all undergraduate students’ final year will include one quarter of the workload as major professional projects – ‘capstone projects’. These projects are an opportunity to develop professional and personal maturity in Swinburne graduates, with an emphasis on inter-discipline, teamwork, industry relevance and/or partners, project management and a range of skills and knowledge gained through active, hands-on, real world experiences. As with the project units that have been running across the disciplines for many years, a great number are designed as group projects of significant complexity and scope. In all cases, students are expected to collaborate effectively, manage their time, and work productively in a manner that reflects a professional approach.

The Hawthorn Project Hub is intended as a place that responds to the needs of a project-based curriculum, and to facilitate a student community of practice.

Nicolette Lee
Swinburne University of Technology, Australia

Figure 1: Hub floorplan
What Happens Here?

The fundamental purpose of the space is to provide a creative space for students to engage in their projects. The nature and scale of these projects is a key underpinning consideration in the design. Students working on major projects will often be required to work extensively together outside of class time, frequently across disciplines, and for some, across faculties. They are expected to meet and, working within their combined timetabling constraints, develop ideas, produce project outcomes and prepare and rehearse presentations. Students engaged in major professional projects require spaces that facilitate collaborative working and a sense of community.

The Project Hub is a dedicated space, large enough for various sizes of project teams, working groups and activities, and is designed to provide the context for:

- Team meetings, brainstorming sessions and general collaboration;
- Small group peer reviews and cross-group collaboration;
- Project development including writing and multimedia work;
- Presentations including inter and intra group rehearsal and review;
- Individual and informal social study; and
- Meetings and presentations with external partners or clients.

In 2007, a proposal was put forward to Swinburne Council to develop a dedicated project space for students at the Hawthorn Campus. The proposal was based on an evaluation of need in three areas: student experience of group projects, increasing emphasis on project-based learning experiences in final year studies, and student reports of a sense of transience at the Hawthorn campus. Swinburne is among the most space-constrained universities in Australia, so space is at a premium. Using commencement data and current student data we can estimate that approximately 2200 students will be undertaking projects in 89 units of study at the Hawthorn campus.

How is the space used?

The space has been designed based on five key concepts based on the project experience: creativity, interaction, reflection, action and communication. This has culminated in a design based on three major design zones: creative, focus, and social.

Creative zones are open spaces with half-height wide shelving/benches providing curved boundaries. These boundary walls also provide storage and high sitting or working space. Inside the walls, comfortable tub seating and low tables are oriented to wall-length whiteboards.

Focus zones are designed in several types: small group meeting rooms accommodating 4-8 students (the average team size); boardrooms designed for meeting clients or giving presentations; and a desktop computer area. The computer area is designed to be wide enough to accommodate groups of students gathering at a computer. An additional ‘docking’ bench is provided at one end of the space along an otherwise unusable wall, for laptop use and recharging.

Three social zones are to be furnished with soft movable seating. In one, wall size pinboards dominate. In the largest, a projection screen makes use of the biggest wall space and viewing distance in the Hub. Each area has differentiated furnishings and fittings to support both informal and formal group activity. Additional booths and tables are placed to make use of what would otherwise be ‘dead zones’ in the space due to access issues, such as plant rooms and storage.

A street access will be opened up to create an operable glass wall to allow the Hub to be opened for public access for events such as student-organised exhibitions.

The whole space, in effect, will operate as a formal and informal working and event space. The openness of the space and its design to accommodate a variety of working activities will allow students to make choices about how and when they make use of the facilities. Feedback from students and academics to date suggests that this flexibility and sense of student-ownership is one of the most valued aspects of the design.

Learning spaces in universities are typically controlled by the university through timetabling and managed access. The Hub is a student-owned learning space, designed to support final year students in a professional community of practice. The aim is therefore to provide students with a space that not only facilitates their project work, but is also a learning experience in itself, effecting a transition to independence. A management committee model, including student representation, will drive future directions for design and management of the Hub, and inform new campus developments. Faculties are also exploring the use of student experiences on a Hub Committee as part of the project experience in itself.

How is technology used?

Technology is to be used to support project activity, including the collaborative processes, client presentations and display of final project outcomes. For day-to-day working needs, desktop PCs and laptop loans have been built in to the plans for the Hub. The infrastructure to support their use includes extensive power access and both hard and wireless networks. Boardrooms
and meeting rooms will have LCD screens with wired connections for laptops and projectors. In the largest social space a wall-size projection screen is fed by a ceiling mounted projector and DVD player with additional wall-mounted speakers. Building on existing student familiarity with the software, the potential for cross-institutional and external partner collaboration is to be supported with web-conferencing.

Along with the technology infrastructure, more traditional working tools are also to be fitted in the space, including wall-length whiteboards in the creative areas. Pin-up display systems for work in progress are included along corridor walls. All of the fitted technology is designed to serve double duty as part of the working experience of students doing group work, and for exhibitions and events. The large projection screen, for example, faces into the largest open social space, allowing for large audiences. Displays and focus room screens mean that every space in the Hub can be utilised for showing as well as developing project work.

**How was the facility evaluated?**

Informal and formal evaluation cycles have been incorporated into the conceptualisation, proposal, planning, and design phases of the project Hub process. The Swinburne Professional Learning Model, the nature of project curricula and the experiences of students undertaking group projects, have highlighted several practical environment needs. Building on some of the insights presented by Jamieson (2007), multiple stakeholders have been involved in the development of ideas and plans as a reference group or actively within the team. The reference group represents a wide range of perspectives, interests and needs regarding the design and evaluation of learning spaces. Students, academics, management and services organisations involved in the development and evaluation of learning spaces, have also volunteered their assistance as critical friends.

As a result, a proposal is underway to develop our evaluation processes further in a comprehensive cycle, taking into account the challenges presented in incorporating the needs of a range of stakeholders. Two national universities - Victoria University and the University of Queensland - are working with us to share evaluation practices. Three international universities and several organisations involved in the development and evaluation of learning spaces, have also volunteered their assistance as critical friends.

The 2008 AUQA (Australian Universities Quality Audit) panel affirmed the Hub’s curriculum-focused design direction, its validity for Swinburne students and as an ‘essential component of the Professional Learning Model’ (Australian Universities Quality Agency, 2008). While the Hub now goes into full construction, more campus learning spaces are proposed. A refurbishment of the Lilydale Atrium is to include a mezzanine project space for students, and independent learning spaces at the Hawthorn and Prahran campuses incorporate some of the student feedback from the hub concept. The themes developed as part of the Hawthorn design, the inclusive process, and the results of the first round of evaluations, will also be fed back into the proposal stage for a new building at the Prahran campus. Students in Interior Design were also briefed with the same project, and the outcomes are to be shared with a newly formed management committee, and have the potential to inform future campus development.

**What were the main lessons learned?**

In the early stages, we were surprised by the sheer number of stakeholders, and confronted by the need to incorporate the sometimes very different perspectives of different groups. The task of bringing together those needs and building consensus required a level of vision and communication that challenged us, but we believe that it also drove the design to a more sophisticated level. Strategic direction and budgetary drivers, as described by Hunter (2006), have certainly contributed to the decision-making process and their impact needs to be taken into consideration in any space planning and evaluation process. Having a space that was originally designed for utilitarian plant purposes has also proven challenging. Agreement has had to be reached to suit the needs of electricity providers, plant machinery and extraction systems, while maintaining a workable design for the students. Managing sound, air, light, heating and access all have presented design challenges to be overcome.

There was also an unanticipated challenge in managing the access systems through our student management system. Collaboration...
The Hawthorn Project Hub at Swinburne University of Technology

between the team, ITS, the library, and Facilities and Services has been needed to solve technical issues in identifying and providing access to students that we would not have guessed at in our early planning, nor would we have been able to begin to solve them without the active support of those groups. The final resolution of some of these issues may not be achieved until several iterations of trials have established the limitations and opportunities of the systems already in place.

Most positively, the enthusiasm of students and academics about the space and the vision of student engagement with it have been extraordinary. We initially anticipated that academics might find the idea that students would invite them into the space to be an uncomfortable one. On the contrary, they have embraced the concept and given their own time to sourcing feedback on how student management might be achieved and facilitated. Our consultative process with representative groups evolved over the period of the design development. In particular, students and academics have been extraordinarily insightful and supportive and could have been even more involved in the design process given sufficient time to deal with the communication issues that arise when engaging with many perspectives. However, the management group for the Hub will become a resource that we can use in the development of new learning spaces across the campuses. Focus groups are now being arranged with students to establish their perceptions of the feasibility of student engagement and representation in the direction of campus spaces.

We believe that the fundamental task in developing new learning spaces is to identify and understand the needs of stakeholders. Asking the target users about their environmental needs and understanding the curriculum it was to serve, in our case, were also crucial. This allowed us to consult widely but also to present a vision with which stakeholders could engage. Support from senior management in the university has also been phenomenal – including those whose parking spaces are being co-opted. Their advice and interest has empowered us to drive forward the vision and understand the potential obstacles to campus development.

Acknowledgements

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References

Lab 2.0

What it is?
Lab 2.0 is an experimental learning space designed for students to be able to alter their physical environment to suit their learning needs. Students are encouraged to "make the space work for them" with new non-traditional forms of movable furniture and related technology. The space is enhanced with technology and collaboration software that enables students to share project work, documents and artefacts in real-time with other group members.

The Lab 2.0 space has been developed in a vacant space within the Library building on the Gardens Point campus. It sits adjacent to more formal computer labs and is seen as a complementary addition to the more structured University computing facilities. The space covers approximately 350 square metres and was redeveloped with a focus on flexibility, simplicity and reuse resulting in a total development cost of slightly less than $90,000 including all furniture, technology, power and data fittings. Based on traditional figures for space redevelopment within the University, the space was redeveloped for between a third and a fifth of the normal costs associated with space redevelopment.

Why it is?
In the area of virtual learning environments considerable thought and attention has been given to the concepts, tools and opportunities surrounding Web 2.0. The Lab 2.0 concept has been underpinned by the idea that we might apply the affordances that Web 2.0 culture provides within virtual spaces, to the design of physical spaces. In mapping this virtual to physical crossover, the design of the initial Lab 2.0 space was based on a number of objectives including:

- Moving from the perspective of a computer lab as an information access space to the lab as a participation/interaction space.
- Providing students with some sense of ownership and control of the space.
- Designing the space around architectures of participation.
- Installing fittings and technologies that allow the space to evolve rather than ‘be designed’.

In seeking to achieve these objectives, the first Lab 2.0 space was established as an ongoing experiment to test next generation learning spaces design principles. The space was co-designed with students with a focus at the outset on meeting changing student learning needs rather than designing in response to a particular pedagogical specification. To meet the challenge of providing a space that could be used in a variety of ways there was an emphasis on:

- Ensuring physical and technological flexibility
  - De-emphasising fixed technology (Long Ehrmann 2005)
  - Creating spaces with a memory (Milne 2007)
  - Providing tools for (collaborative) remediation of digital content
  - Leveraging student technologies including mobile devices
- Ensuring that the space was zoned for sound and activity
- Ensuring that the space supported ongoing experimentation and evaluation that can guide ongoing institutional adoption. (O’Brien 2006)
- Ensuring that the outcomes established in the spaces could be cost effectively replicated elsewhere across QUT.
What happens here?

The space is used in a variety of different ways depending on the time of the semester. At a broad level, the space is used in the first and last parts of the semester as an individual reflective space, however during the middle of the semester (weeks 4-11) the design of the space facilitates group collaborative activities. During this time, a range of different group related activities have been observed including:

- Real World Learning and Work Integrated Learning
- Peer Partnering and Peer Assessment
- Problem Based and Inquiry Based Learning
- Reflective, Creative and Critical thinking

Observation of activities within the space and data collected from survey results and wireless usage logs suggest that the predominant users of the space are undergraduate students doing science or engineering units. It is speculated that the space supports their needs to manipulate text and graphics and utilise visual frameworks and models, as part of their assessment and problem solving activities.

A number of staff teams involved in various project related activities have been observed using the space suggesting that the utility or this type of space extends beyond student requirements to more broadly the support of group based activities. Staff adoption also suggests that attraction to the use of ‘funky’ and non-traditional furniture is not limited to younger students. It appears that the sheer functionality and flexibility of the space is the defining characteristic.

The common characteristic for all users appears to be their desire to use a range of technologies in an easily configurable group setting to share and jointly create documents, diagrams, and models and/or to access a range of technologies, tools and content in order to solve problems.

How is the space used?

In order to support a variety of uses and reflecting its experimental heritage, all the furniture in the space is both lightweight and easily portable allowing students to make the space their own. Furniture ranges from non-traditional recyclable furniture designed specifically to support dynamic group work, to more traditional ergonomic lab-based furniture. The sense of ownership and privacy is enhanced by the use of lightweight expandable paper walls that student use to create their own ‘private’ space.

How is technology used?

Like the furniture, the computers and plasma screens that form the basis of the technology provisioned into the space are designed to be mobile and flexible. All technology is situated on mobile trolleys that utilise umbilical cords to allow students to move them around, within certain parameters, to use them as they wish. The mobile
workstations allow individual use, facilitate connect to a student laptop and come installed with TeamSpot software to aid group collaboration.

TeamSpot software (http://www.tidebreak.com) allows students to create virtual collaboration teams by connecting a number of their own laptops to a central plasma screen and then either share documents via the central screen, share documents with other laptops in the team and/or co-create documents on the central screen. Unlike collaboration spaces that use small computer screens, the use of larger plasma screens means that a number of students can be meaningfully engaged together in real group work. This high-tech solution is matched with another popular low-tech element in the space: small mobile whiteboards. A typical configuration in the space is four to five students with a range of furniture types suiting both their own individual and group needs with a whiteboard and a mobile collaboration workstation.

How was the facility evaluated?

The evaluation of the space has been based on a series of complementary and compounding evaluation methods allowing for both triangulation of key issues and analysis in depth of findings. The approaches used to date include:

- Student experience evaluation: facilitated by an ongoing space user’s survey designed to gather data about student attitudes to the space and its contribution to their learning experience. The survey contains both closed and open-ended questions designed to test students’ views of the space; the elements they like or dislike; the ways in which they use the space; and the technology they use in the space. The survey also acts as a mechanism to elicit further design ideas that will be used in the evolution of the space over time. The survey remains open and to date there are over 100 responses.

- Technology utilisation and adoption evaluation: facilitated by analysis of system and wireless access logs to provide an overview of technology use and preference. One of the interesting elements of the analysis is the number of repeat users, those students who return again and again to use the space – an indication, in part, of the durability of the design to meet ongoing needs.

- Evaluation of the level of knowledge work undertaken in group collaboration sessions: facilitated by informal analysis of the nature of student content left on both the mobile collaboration workstations and whiteboards at the end of each day.
Two remaining forms of analysis are currently being implemented. They are:

- **Space utilisation and adoption evaluation:** facilitated by time-lapse recording of the way in which the space is configured and reconfigured by students. It is expected that this will help confirm and provide an understanding of how the use of the space changes across the academic semester.

- **Learning outcomes evaluation:** facilitated by student focus groups designed to unpack trends identified in each of the previous evaluation approaches and ratified by a broader range of evaluation instruments such as discipline specific mapping of the curriculum with the space as well as drawing upon the data generated by the above approaches. This approach will build upon the Flashlight methodology of evaluation. (Ehrmann, Milan and Group 1999)

**What were the main lessons learned?**

While the Lab 2.0 experiment is ongoing there are a number of lessons that have been learnt to date. At the level of the space itself, the Lab 2.0 project has shown that:

- Space design needs to facilitate changing demands and building single purpose spaces (e.g. purpose built group collaboration spaces) may not be an effective use of space for universities with limited space.

- Effective and meaningful group collaboration can be facilitated in a cost effective and relatively simple small-scale manner, implying that this type of model could be used in any spare space across a campus – including outdoors.

- Student learning preferences are hard to predict but spaces designed around flexible fittings and technology allow students themselves to design and redesign spaces to suit their specific and changing needs.

- Mobility of items increases utilisation – mobile collaboration workstations are utilised at a rate of 2 to 1 over the same technology fixed to the walls of the space.

- The way furniture is used by many students is sometimes inconsistent with the intentions of spaces designers and furniture manufacturers – within the Lab 2.0 space tables are often used as seating surfaces and seating items are regularly re-purposed as layout or workspace.

- Risk management and innovation are not necessarily good companions – in the design and implementation of this experimental space there were a number of examples where new policy was needed and some central elements needed significant convincing to try things that were not necessarily consistent with previous practice.

At the level of the users of the space – students, a range of addition lessons have been identified including:

- Students both enjoy the use of the Lab 2.0 space and believe that it has a positive impact on their learning outcomes.

- The use of students as a co-design partner is both feasible and provides for highly interesting and useful outcomes.

- Higher order group thinking flourishes when the right blend of physical and virtual elements are brought together – analysis of content remnants suggests that either alone is insufficient.

**References**


What it is?

The Thurgoona Learning Commons (TLC) is a learner-centred space that facilitates learning outside the classroom setting. It is located in Albury-Wodonga on the Thurgoona Campus of Charles Sturt University (CSU).

The Thurgoona Campus has an international reputation for its environmentally sensitive design and its focus on sustainable living, energy and water conservation and habitat preservation. Buildings on the campus are sited and designed to maximize natural ventilation and lighting, using sun shading and landscaping to reduce energy use. Water is harvested and recycled. Woolen carpets, natural linoleum, recycled and plantation timbers and low volatile paints provide healthy indoor air. The design of the TLC follows these principles.

The TLC building is designed to accommodate the Library and its services and collections; Information Technology help services; Learning Skills Advisors; and Indigenous Student Services. It has a café and a 24-hour access space. Adaptive technology to assist students with disabilities is available in the 24-hour space.

Specially designed areas are available for researchers and for parents who need to bring very young children onto campus while they study. There are three teaching areas fully equipped with PCs and designed to accommodate classes of up to 16 students. Two of these teaching spaces are transitional and expected to disappear within two years as other facilities develop on the Campus. All three areas are open to casual use when they are not used for classes.

The design of the physical spaces and furnishings designate the use of the area: from noisy, social and collaborative spaces located, to the rear, facilitating noise control and a stronger sense of privacy in the quiet, individual learning spaces. The Library collection is arranged to buffer noise and create different sorts of learning spaces. Group rooms provide spaces for discussion and rehearsal of presentations.

Furniture is a mixture of fixed and movable tables and chairs, with couches and easy chairs for less formal interactions. Moveable furniture can be reconfigured to accommodate different sized groups as required. Electricity and data connections are provided in all fixed furniture and via cabling pods for the flexible areas. Wireless connectivity is available throughout the building and in the quadrangle outside. The TLC is designed to accommodate learner provided technologies, but desktop PCs and Macs are available and students can borrow laptops for use in the building and its environs.

Why it is?

Student support services at CSU are visualised as spanning a continuum from administrative support to learning support (Figure 1).
The end goal is a Single Point of Contact where students can have all their enquiries resolved without any need to understand the organisational structure of the University and without any need to be physically present at any particular point. Support services are available face-to-face or virtually, synchronous or asynchronous. Support services are tiered by level of complexity (Figure 2).

The objective is to have as many queries as possible answered at Tier 0 so that queries are answered at the point of need at the time of need. Because 75 percent of CSU’s 34,000 students are enrolled in off-campus modes, the virtual component of service alignment and delivery is extremely important.

The TLC operates at the learning skills end of the service continuum. It provides a physical manifestation of the Single Point of Contact. The services relating to learning skills are provided by four separate organisational units at CSU including Library Services, IT, Learning Skills Advisors, and Indigenous Services. The staff from each of these units is co-located in the TLC building. Service alignment across organisational units and tiers of service is an essential ingredient of the concept. Tier 1 services are provided from a single service point, backed by a common knowledge management system. Tier 2 and Tier 3 services are handled by specialist staff in physical spaces that provide greater privacy and confidentiality.

The TLC is not just a service delivery point; it is also an integral part of the Learning & Teaching Precinct on the Thurgoona Campus. Pedagogies were mapped to spaces within the Learning & Teaching Precinct, including outdoor spaces (Figure 3).

The TLC caters for self-directed, non-facilitated, collaborative learning; providing facilities for individuals and small groups, and interactive videoconferencing for collaboration at a distance.

The virtual aspect of the learning spaces provided in the TLC is just as important as the physical spaces, and for the same reasons as the virtual aspects of service delivery are important: the high proportion of off-campus modes of study.
The physical learning spaces of the TLC are complemented by the virtual learning and collaboration spaces and tools provided through CSU Interact - the University’s SAKAI-based online collaboration and learning environment.

In designing the physical layout of the building, we started by mapping the learning strategies that would occur within the TLC to the activities associated with those strategies, and then placing the activities into four zones (Figure 4):

- Social zone;
- Group collaborative/interactive zone;
- Group creative/presentation zone; and
- Individual study zone.

As learners move from the social zone to the individual study zone, they also move from noisy spaces to quiet spaces.

Functions were then mapped to the zones (Figure 5). Service points and specialist usage spaces (such as group discussion/presentation rooms, microform and multimedia viewing areas) are located in the relevant zone. Some functions overlap zones.

In this schematic map:

- The green spaces are 24-hour spaces.
- The yellow spaces show where service provision is located and how different services relate to the zones. For example, Open Reserve and the Enquiry point are closer to the social interactive zones than Learning Skills and Indigenous support that are more private.
- Moving from yellow to red indicates the gradation from more public to more private functions.
- The blue areas contain quieter functional spaces, using the collection to buffer sound and to define study areas.
- The size of each lozenge indicates the relative size of the space required for the function.
The architects used this information in designing the building.

The design aligns with the environmental sustainability principles that underlie all development on the campus. The building is oriented so that the entry is north facing. Glazing along the walls and in the stepped roofline allows maximum natural light. The collection is located in the centre and towards the back of the building to shield it from sunlight and to provide the best temperature and humidity control for preservation. People are located at the front and sides where there is maximum natural light and views to the outside.

The social zone is at the front of the building, and activities move through Zones 2 and 3 to Zone 4 - individual study - at the back. The roof-line steps down from front to back, and the glazing reduces, so that the individual study zone is lower and cosier as well as quieter.

The Learning & Teaching precinct is designed in the belief that learning is something that occurs everywhere. The whole precinct is a learning space with different sorts of nodes, one of which is the TLC (Figure 6).

Network access and social learning spaces indoors and out are part of the concept. Landscaping of the quadrangle takes account not only of environmental considerations, but also the provision of social learning spaces. Wireless access covers the entire precinct.

**What will happen here?**

The TLC is a learning space outside the classroom that sustains the learning experience from the class session into other learning contexts. It provides an integrated environment with spaces and technologies that support learning theory principles. It is a student-centered learning space that provides seamless access to the University’s information resources; supports all flexible learning methodologies that students may require now and in the future; and facilitates socialisation as part of the learning experience. It facilitates self-directed, collaborative learning by individuals and groups. The locus of control is in the hands of the learner.

The TLC is also a Single Point of Contact that provides seamless access to support services at the learning skills end of the support continuum.

**How will the space be used?**

The TLC is not yet occupied; however the planning and design are based on Stage 1 of the Learning Commons on the Bathurst Campus. The Bathurst Learning Commons is grafted onto an existing building and provides the 24-hour functionality and spaces that form part of the TLC. Observation and assessment of activities at Bathurst informed the development of the TLC. Students use the space across the whole spread of hours, 24/7. CSU has a high proportion of residential on-campus students and all rooms in the residences have access to the University’s network. However students prefer to use the Learning Commons because of the social interaction possible in the space. They will queue up to use equipment in the Commons area, and sit on the floor if nothing else is available, rather than move to the more traditional library space. This applies even if they are working alone rather than as part of a group.

When the Library proper is closed, access is via the CSU ID card. Security is enhanced by CCTV cameras that scan the interior and exterior spaces and display on large plasma screens inside the Commons. Students can see what is happening from wherever they sit. This is popular at night – students like to be able to see what is going on immediately outside the Commons before they exit.

The adaptive technology area is located in the 24-hour space. It is a glassed enclosure that offers privacy but allows connection to the social activities in the Commons. Use of these facilities has increased.

The Learning Commons has changed the social dynamics of the Campus: activities now centre on the spaces around the Commons. The Commons is the place to be: to meet up with friends, to work together in formal and informal groups, or to work alone in a social space.

**How will technology be used?**

Based on the Bathurst Learning Commons experience, technology is used as a tool in the learning process – students take it for granted that what they need will be available to them.

The space is designed to be highly flexible, catering for student-provided technologies. At present this means laptop computers and a mix of wireless and wired connection and lots of power points, but iPhones in particular are introducing new expectations.

Groups of between two and four students cluster around workstations and larger groups around laptops. Furniture is reconfigured to suit the needs of the students at the time. It is notable that the ergonomic chairs provided at fixed workstations are almost always substituted for casual chairs. Laptops are often used by students sitting or lying on the floor.
How will the facility be evaluated?

Evaluation of the TLC will follow the techniques used to evaluate the Bathurst Learning Commons. The methods used included formal and informal feedback from:

- Library specific client satisfaction surveys
- Course evaluation questionnaires and the First and Final Year evaluation projects at University level
- Library online forums and the Library Blog
- Library suggestion boards, physical and virtual
- Observation of actual use
- Patterns of use from login and door entry statistics

At Bathurst, students like the noise and vibrancy of the space and its physical appearance, they feel comfortable there. Access to the café and the refreshments via vending machines outside café hours is highly valued.

Group study rooms are popular for larger groups and to rehearse group presentations. Whiteboards are still in demand, regardless of other technologies and collaboration tools available.

Students move from the Commons area into the quieter parts of the Library when they want to concentrate on individual study or when they are studying for exams.

Requests for help with a range of issues are addressed to the “Ask us” desk at Bathurst, although it is not yet set up as a single point of contact for the full range of learning support issues. Students like to be able to ask someone for help when they can, although the full range of online and telephone services are also well used.

Students regard the social aspects of campus life as an essential ingredient of the on-campus experience, a feeling shared by Distance Education mode students when they are on campus for residential schools which are part of their course. The Commons and the student bar are cited as significant aspects of that experience.

What were the main lessons learned?

Feedback from Bathurst used to inform the design of the TLC indicates the following:

- Furniture and equipment must be reconfigurable by the users on demand
- Fixed workstations are valued only when applications require high speed and good bandwidth connectivity
- There is an increasing demand for videoconference access to group members who are physically scattered
- Noisy social spaces are highly valued for most activities, but students want to move to quiet spaces for tasks requiring in-depth thinking and for exam preparation – ability to reconfigure spaces at different times in the academic year should be considered in the design
- Flexibility is the key: usage changes very fast with or without corresponding changes in technology
- Never underestimate the indoor/outdoor flow of activity. Students like to work outdoors even when climatic conditions are far from inviting

Acknowledgements

Academic staff at the Thurgoona Campus gave considerable input to the pedagogical map for the Learning & Teaching Precinct and how different nodes in the Precinct could be used to provide a comprehensive learning experience. These discussions were initiated by Caoimhin Ardren, Project Manager for the Campus development and facilitated by staff in the Centre for Enhancing Teaching & Learning led by the Director, Associate Professor Marian Tulloch.

Leslie Burr, Director, Learning & Access Support championed the principles underlying the concept of the Single Point of Contact within the University.

Staff of the Divisions of Library Services, Student Services, and Information Technology contributed to (and continue to develop) models for delivery of seamless services to students and for how operations will be managed in the TLC building. Kerryn Amery, Director, Operations (Library Services), Liz Smith, Manager, Learning (Student Services), and Phil Setton, Director, Customer Services (IT) lead the teams developing service alignment and management models.

Doug Westland and Bernard Jovaris from JWP Architects translated the concept models into a physical building and provided the floor plan.
Charles Sturt University – Thurgoona Learning Commons
Construction Completion - September 2008
JWP Architects
Learning in the Learning Commons: The Learning Commons at City Flinders and St Albans Campuses

What it is?
Since 2006, the development of the Learning Commons has been a key strategic direction for Victoria University, driving the re-development of libraries, campus learning spaces and educational support services and programs. This study will report on evaluations of two examples of the Learning Commons at VU: the City Flinders Learning Commons and the St Albans Learning Commons, with a focus on the impact on student learning achieved at each location.

Why it is?
At VU the Learning Commons aims to put the student ‘at the centre’ by providing an educational one-stop-shop, integrating services and functions that have been separate in the past. According to Keating and McLennan (2005, 10):

… students should not have to understand the organisational structure of the University in order to access the support and resources they need for their learning ... The Learning Commons is a learning space that is open – in terms of reflecting the need of students to learn when they have time – often outside the usual University opening time and also reflecting students preference for flexible spaces that can be moulded and modified to suit their preferred learning styles ... The Learning Commons is an approach to supporting our students’ learning that recognises that we need to take into account the entire learning experience of the learner while at university, not just their time in the classroom.

The Learning Commons has been guided by a set of principles designed to make learning the primary focus. These principles are that the Commons should:

- Facilitate active, independent and collaborative learning;
- Focus on student needs, preferences and work patterns;
- Be part of a University-wide development of learner autonomy;
- Be responsive to the changing needs of learners for resources and support;
- Be based on collaboration between different support areas in the University; and
- As a community space provide a hub for physical and virtual interaction for staff and students.

What happens here?
The City Flinders Learning Commons opened in October 2006 and became a testing ground for the Learning Commons model developed at VU. Against a background of striking city views, the Commons combines a library collection, diverse spaces to support different learning styles and a mix of educational services and programs. The St Albans Campus Learning Commons was developed in mid 2007 through the large scale refurbishment of the existing Library space, including the development of new discrete learning spaces as advanced ‘assisted study’ environments.

At both locations educational support services and programs are provided through a collaboration between the Library; Academic Language and Learning (ALL) and Student Career Development (SCD) staff in the VU College (VUC); and Information Technology Services (ITS). At the centre of the new service model are Student Rovers, who offer student peer mentoring to provide practical and motivational learning support for students.

<table>
<thead>
<tr>
<th>CITY FLINDERS</th>
<th>ST ALBANS</th>
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<tbody>
<tr>
<td>Opening Date</td>
<td>Oct 2006</td>
</tr>
<tr>
<td>Architects</td>
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<tr>
<td>Services</td>
<td>Library, IT, Learning Support, Careers, Student Rovers</td>
</tr>
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</table>

Adrian Gallagher, Amanda Pearce, Robin McCormack
Victoria University, Australia

Table 1. Learning Commons Services and Metrics.
How is the space used?

Each Learning Commons contains a variety of learning spaces to support different learning styles ranging from informal, collaborative, technology intensive, formal (training areas) and reflective. Although neither learning space contains a café, both are food-friendly to encourage the social use of each space.

A Learning Commons service model has been developed to coordinate educational support services to students in these spaces and set the pattern for collaboration and cooperation in the provision of services. This model works to a background of automated self-help and embedded support at the course and faculty level. The three layers of the model delineate services from first level enquiries to technical or functional support at service desks up to the specialised consultations and training required for advanced information seeking and knowledge creation.

The first level of this service model relies heavily on the ‘Rover’ team involving later year VU students. They are selected and trained by the collaborative team formed by Library, IT and ALL staff, coordinated by an ALL academic and supervised by campus librarians on a daily basis. The Rovers’ role includes:

- Assisting with basic student queries related to using and locating core facilities, information resources, software and hardware
- Helping students to clarify and articulate basic issues related to their learning strategies
- Directing students to options or to further information that may assist them, or referring them to ITS, Library, ALL or SCD staff or other services such as Counselling.

As successful students, Rovers mentor student ‘communities of learning’ by modelling and facilitating successful approaches to learning. They systematically share knowledge, skills and insights through a RoverSpace blog and wiki, thereby also developing their VU Graduate Capabilities (including teamwork) and fulfilling learning in the workplace requirements. Thus the Rover program is deeply embedded in social and collaborative learning models, both in the context of the Rover team itself and insofar as these models underpin the relationships between Rovers and others.

How is technology used?

Technology is a pervasive feature of the Commons aiming to be the major point of student computing on campus with access to a standard desktop image supplemented by specific learning software, a complete wireless network and printing/scanning infrastructure. This level of technology is essential for delivering program content via WebCT, administrative
processes through the MYVU student portal and digital information resources. The University also recognises the potential of social networking Web 2.0 technologies and therefore provides Internet access in a relatively unrestricted environment.

**How was the facility evaluated?**

Most attempts to measure the success of the Learning Commons have focused on indicators of activity or measures of user satisfaction. The task of assessing the impact of the Learning Commons on student learning is more difficult and beyond the scope of the most commonly used metrics and evaluation tools. Bennett (2005) notes that in 240 construction and renovations projects in libraries from 1992 to 2001, there was a lack of evaluation of resultant student learning. One challenge in assessing the impact on student learning is the difficulty of getting students to articulate their learning experiences when collecting data and feedback. Student feedback can be restricted to their access to resources within learning spaces or the basic activities that are undertaken in the Commons, presented without commentary or self-reflection. A more detailed articulation of learning impacts may require a relatively atypical meta-cognitive awareness of their own learning on the part of student Commons users, as well as a set of beliefs that recognises and legitimises collaborative and peer learning rather than being restricted to a transmission model. Thus a successful evaluation of the Commons as a site for non-transmission forms of learning may depend to some extent on the success of the whole institution in moving away from transmission models and developing meta-cognition in its students.

The VU enabling principles of the Commons (outlined above) are the focus of our assessment, with particular attention to ways in which the space supports active, collaborative and independent learning; provides a community space as a hub for physical and virtual user interactions; and offers flexible support that can effectively respond to the changing needs of learners.

In terms of evaluative techniques, some quantitative evidence of the success of the facility is required as context for our evaluation of learning outcomes. This includes usage and services statistics along with measures of student satisfaction traditionally collected by the library. However to provide evidence regarding the Learning Commons impact on student learning, a range of qualitative data has been collected including survey comments, focus group transcripts, student diaries and Rover end of shift reflections.

The student survey comments were derived from the Library Client Survey conducted in second semester 2007 using a service quality instrument developed by Insynch Surveys. A total of 1684 comments were provided in the responses from users at the City Flinders and St Albans Learning Commons. Thematic categorisation of these comments was undertaken loosely following the approach outlined by Ryan and Bernard (2003) in examining repetitions and key words in context.

A series of focus groups were conducted in May 2008, including two student sessions at both City Flinders and St Albans, along with a session containing a selection of staff who directly provide services in the Commons environment. Student volunteers were recruited by Rovers and library staff from the floor of each Commons, and the groups were conducted by a researcher from the University’s Post Compulsory Education Unit. Analysis of the results followed a focus on thematic content following the approach outlined above.

The student diaries combined features of mapping diaries – as inspired by the 2007 University of Rochester Undergraduate Project (2007) – and reflective diaries allowing students to comment on their activities within each space. The students were recruited at the City Flinders Learning Commons and before commencing the diary, were instructed in the diary tool by the campus librarian. They were also provided with some examples of the general categories of data needed to be collected, with a view to focusing attention on the meta-cognitive aspects of the survey. However care was taken to avoid the ‘Hawthorne Effect’ and ensure the diary instrument was not distorting students’ learning behaviours through recording them.
Lastly, data examined in relation to the Rover program included transcripts of Rover Debriefing sessions and Rovers’ End-of-Shift Reports. These were thematically analysed as described above.

A crude form of evidence of the Commons’ responsiveness to students’ needs is provided by usage and satisfaction data. Visit statistics at each Commons provide encouraging data on usage, with the City Flinders door count increasing by 85 percent from 2006 to 2007, while the St Albans Commons experienced a more modest increase with usage rising by 25 percent when comparing first semester 2008 door count to the same period in 2007. More evidence of the popularity of the Commons is provided by SCD (Careers) statistics from first semester 2008; all categories of service had increased when compared to the same period in 2007, with a 90 percent increase in ‘drop in’ enquiries and consultations suggesting that the reach of the service is benefiting from inclusion in the new educational service model of the Commons. Another positive indicator evidenced in the Library Client Survey was that overall library client satisfaction has increased by 10 percent since the library has been a Commons.

Of the qualitative comments attached to the 2007 Library Client survey, about 19 percent of overall responses related to student learning areas and 29 percent related to student computing needs. Unfortunately the comments did not contain many reflections on the capacity of the space to support different learning styles; most responses on both individual (reflective) and group (collaborative) spaces were calls for more learning spaces, particularly at City Flinders. However the fact that these were often combined with complaints about noise suggests that provision for silent and group study need to be carefully balanced, difficult in a very small space such as City Flinders where the Commons zone constitutes the entire Library. Comments on student computing provided few insights into the role of the technology in learning outcomes as these issues were swamped by an overwhelming demand for the provision of more PCs. Other comments requested not only more study rooms for collaborative work but also protected spaces for individual study. At City Flinders, this emphasis may be a result of the large numbers of Postgraduates studying onsite. Some comments at St Albans called for more casual (social) areas; however the utilisation of the Commons as a social space was not a strong theme in the responses and more likely to be identified as a source of disruption. Where the recent St Albans renovations were discussed, the response was generally favourable as students appreciated the visible investment in their spaces. Typical comments include:

- Unfortunately I think there has been a reduction in private study areas. It’s great that there is (sic) now areas for groups but there needs to be more places for individual study [City Flinders]
- The new renovation for the campus library is fresh and gives off a welcoming vibe [St Albans]

In comparison with the survey data, the focus groups provided more fertile ground for exploring participant experiences relating to learning in groups and the role of the Commons as a social space in the development of communities of practice. Although much of the discussion still registered student concerns about shortages of spaces and resources, the group discussion was able to express the regularity and context of working in groups, its place in the curriculum and an understanding of the value of group work:

- Yeah group assignment, then we definitely have to work in groups and then by doing so we do the interaction straight away in front of the computer … we talk, that’s it. [St Albans]
- Gives us that opportunity to be able to learn, to work with other people because there [may be] that reality when we go into the workplace. [City Flinders]

The social dimension of learning and the presence of community within the Commons is an encouraging thread of discussion. Throughout the focus groups, participants express an easy confidence with technology identifying attributes of the ‘net generation’ identified by Lippincourt (2005), such as multi-tasking between applications and moving seamlessly between the academic and the social through technology:

- I think it’s different for each person. I know if I sit there and try and … just sit there and write just non-stop I’ll just burn out and lose interest so what I’ll do is I’ll type up a paragraph, check MSN, just have a chat to some people and then back to - - - (again) - - - [St Albans]

In contrast to the survey data, the presence of community was identified in focus groups as tending to focus students on their work:
In here I guess you get more motivated because you see others studying but when you’re at home you get to do some other stuff that’s not study related….[St Albans]

It was clear from the combined focus group and survey responses that there was an uneven appreciation of the range of educational services and programs provided in the Learning Commons. Although the survey registers consistent satisfaction with library staff and Rovers, there is less recognition of the more recent entrants to the Commons service areas (SCD and ALL Support staff) and of the range of what is on offer or the benefits of the educational one-stop-shop approach. The range of responses is illustrated by the following comments:

Yeah but overall there’s help everywhere, from the student Rovers, the service desk, in the tutor centre and then there’s the brochures there if you want to know how to reference at least there’s areas where you can go for help. [St Albans]

Student A I’ve seen the careers section in the Library …

Student B I don’t see anyone in there. [St Albans]

I think that the idea is messed up because … okay you wanted to bring in everything but then the things should have been brought in and there should have been different sections and it should have been managed individually … what happened here is like … they just dumped in everything … they should have different sections for individual studies, different section for… using computers, different section for (giving) books … [City Flinders]

The student mapping diaries provide evidence of learning in both group and individual contexts adding revealing details about their study patterns and usage of the different parts of the Commons through different periods of the week. Each of the 10 students refers to the Commons as a meeting place, mixing social encounters with acts of mutual assistance throughout their studies. Technology is a pervasive feature of their activities throughout the week as assignment work and social interaction is conducted through a variety of systems: WebCT, student email, hotmail, MYVU (VU student portal), Google, library databases and Facebook. The diary narratives throw into relief the unmediated nature of much of the activity within the Learning Commons as so much is accomplished through online services such as WebCT, self-service borrowing equipment and the self-service infrastructure of the Commons. Only one participant refers to seeking help on a regular basis throughout the week.

One weakness of the diaries is a tendency for entries to be descriptive without students reflecting on their learning experiences. When instructing students in using the diary, it is difficult to encourage reflection without inadvertently transforming instead of documenting student practice. In fact Catherine Tang (2002) recommends that reflective diaries work best as a tool to facilitate both reflection and learning in a cycle where understanding reflects on practice and where improvements in practice, fed by reflections on learning, are encouraged. In this context the diaries may work better as part of an assessment tool embedded in academic programs where students can relate their growth as learners and present the contributions from the Learning Commons as part of this broader learning development.

The ongoing Rover evaluation focuses on the effectiveness of the Rovers in the City Flinders Learning Commons as an approach to supporting other students’ learning and to develop Rovers’ VU Graduate Capabilities. The qualitative data from the Rovers themselves suggests that the Rover program supports active, collaborative and independent learning both in terms of collaboration with other students and within the Rover team itself. The Rover program does not simply provide an additional element to the Library service delivery model (McCormack and Dixon 2007); Rovers model and advise on the learning behaviours underpinning university study, including active and independent learning.

If they know their way around this place, and can act with confidence, maybe I too can learn all these systems. They even know who to ask when they don’t know!

We had a few students come over for a chat, we had four students who wanted to just sit and chat to us about their assignments and tests that they have in the next few weeks. Because we have already done those subjects we gave them a few tips on how to overcome the hardship throughout the term.

A student called Mohammad came and asked for help with accounting….well he was confused with some transaction. I helped him out. He was very happy. He needs help with management accounting as well…so he said he will come back next Thursday, so that Richard (former management accounting mentor) will be here and help him out.

Social and collaborative learning is central to the experience of actually being a Rover, within the Rover team. As well having a physical place at the Rover desk in the student space, Rovers work to create a ‘social presence’ in the Commons by establishing friendly relationships with as many students as possible. One example illustrated significant social interaction between international and domestic students, the promotion of which is currently a major challenge for the sector:

[I had] a conversation with [three] international students I see regularly, one of them Ahmed … gave a little lecture on culture which was very interesting! He asked me a few question[s] about where I am originally from (Lebanon) and then he said on first impression - including accent, dress etc. I look very Australian but after talking to me about values etc. he said he believes I appear to have Lebanese values imbedded in me … he said … I get the best of both worlds in this way!
Lastly, the social aspect of Rover activity extends to staff, with transformative potential relating to staff-student interaction:

I helped out a session tutor find a videotape! He was an interesting guy – he tutors in the art subjects and we had an interesting conversation on the difference in the arts subject and legal subjects. Let’s just say the arts people seem to have more fun when doing assignments - no 3000-word essays on law reform for them! In fact Rovers extend the space beyond the boundaries of the physical Commons: as a consequence of being very visible and widely acknowledged as ‘go-to’ students, their advice is sought even when they are not on Rover duty - be it on a different campus, on the train, or in a lecture theatre: ‘Few students came and say Hi … while I was having breakfast in Mc’s’.

Yesterday I was in Queen Street Campus Library, and saw many known faces from City library. Guess what! They were thinking I was doing my Rover’s shift up there! I helped one guy with Web CT, and told them that Rovers are yet to come to Queen Street Campus Library.

There is a wealth of evidence that Rovers provide the sort of practical assistance required for students to become independent and active learners. Rovers have a sense of responsibility for good functioning of the space:

We are still having trouble with the printing, as some of the computers still have signs popped up saying that the printers have to be re-installed … Currently, CF1507-10, 27, 54, 51 are not working,… So please keep an eye on the PCs, Rovers!

The Rovers offer flexible support that is responsive to the changing needs of learners, and are required to learn new things to provide support to other students, for example new desktop applications or new academic software such as Turnitin.

Alongside this reflective practice shared on the Rover blog is the ongoing evaluation undertaken by the Rovers as researchers/evaluators of their own practice. This has taken a participatory action research approach. ‘Instead of a linear model [of evaluating practice], participatory action research … proceeds through cycles, ‘starting’ with reflection on action, and proceeding round to new action which is then further researched’ (Wadsworth 1998). Thus Rovers reflect on their practice and make changes to it. These changes have included the introduction of a Rover desk at City Flinders, thereafter included in the designs for subsequent LCSs; a new Rover-developed statistics record sheet to include records of referrals; and a new approach to Rover training and knowledge management including ‘Lead Rovers’, a new collaborative software platform, Rover webmasters and training teams.

The reflection that Rovers engage in is perhaps summarised by one Rover’s description of a single incident. After assisting a student to log in and register on the VU Careers system, the Rover chatted to him about searching for a job. As a result she oversaw the whole process of preparing and sending a job application online, including commenting on his spelling and grammar, and referring him to the SCD resume checking service. She described her roles in this exchange as ‘un-bossy, but laid-back big sister’, and ‘mentor’, commenting:

At the end of that day shift when I was in the train what I … realised was that at that moment not only professional help took place but a social network between a Rover and a student, a social network between a student and the learning commons, and finally, in a broader sense a network between a learner and VU took place in a positive way.

What were the main lessons learned?

The major evaluation findings have been outlined above. In summary, there is some evidence that the space successfully supports active, collaborative and independent learning, and perhaps more conclusive evidence that it provides a community space as a hub for physical and virtual users interactions and offers flexible support that is responsive to the changing needs of learners.

Specific findings are that:

- The Commons has improved usage and satisfaction statistics
- The space requires careful planning to balance students’ needs for quiet and noisy space
- The capacity for students to use technology for both private and study purposes, and to observe other students’ study practices appears to assist learning outcomes
- More work is required to increase students’ awareness of the types of assistance available in the Commons by improving the profile of each service and the level of coordination between services (although current staffing constraints may be a problem here)
- The Rover program is very positive in terms of collaborative learning within the Rovers team and in Rovers’ mentoring role, i.e. a form of collaborative learning shared with student users

However in terms of the evaluation methodology, more effective methods need to be developed to triangulate the perceptions of the Rovers themselves with those of student users of the Commons in order to further explore the Commons as a social space in the development of a learning community. New ways of encouraging students to articulate their learning are required, including gathering data from students who may
be non-users of the Commons spaces. This raises the challenge of students’ meta-cognition and the success of the university as a whole in developing the awareness of students of their preferred learning styles and what supports they require. The evaluation of the Learning Commons is therefore an ongoing project, requiring the involvement of a broad range of Faculty and other staff, and a continuing management commitment to active, collaborative and independent learning across Victoria University.

References


What is it?
The Street area is the central point of the University’s main teaching building. Until recently, it was merely a transition space – people would move through it in order to get to their next class. It is a large rectangular area measuring approximately 20 by 5 metres and rising three stories high. In many ways, it resembles a classical loggia.
The new space consists of a raised, carpeted seating area. Large, comfortable couches, free-moving ottomans, and circular coffee tables are located in this space. The couches are of the highest commercial quality to guard against stains and potential misuse. Each of the coffee tables has four inbuilt power points for students to be able to plug in their notebook computers and other electronic devices. The entire area is also wireless. The total cost was approximately $30,000.

Why is it?
One of the patterns of student behaviour observed in recent years is that students will only be on campus for particular classes or events, such as social functions or examinations. The students’ perspective of the University was that it was a place where they would visit in order to attend classes, not necessarily as a place that was essentially providing a once in a lifetime experience! Many students live in the adjacent suburb of Varsity Lakes, and can easily slip home when not required on campus. There were very few places on campus where students could spend substantial amounts of time if they chose to stay. One of these was the Library. Before the advent of the Street and the Multimedia Learning Centre (see the related case study), the Library was often at capacity throughout semester. The original design of the Library did not cater for this demand.

A strategic decision was made by University management to rectify the above. In their consideration, one of the purposes of a university, and a feature of the Bond experience in particular, is to foster a sense of community across a range of people and disciplines, and to encourage many levels of interaction – social, intellectual and collaborative. Following the 2007 Colloquium on Next Generation Learning Spaces, the rejuvenation of The Street was identified as project that could help to achieve these goals.

Figure 1 shows the plan of the space while Figure 2 shows various photos of the Street area from several angles.

Marcus Randall, Gail Wilson
Bond University, Australia
The key players in the design of The Street were Marcus Randall, Cathy Murray and Senior Management Group. Marcus Randall and Cathy Murray were responsible for the original concept. Senior Management Group suggested revisions because of concerns about security (i.e., that some students may want to take some of the more movable pieces of furniture). The subsequent redesign of the space was accepted.

What happens here?
The Street was designed to be an informal area for staff and students to spend their time between classes, and as mentioned above, a place that helps to develop a sense of University community. In some ways, it is similar to the seating areas within airline lounges, as students often use it as an area that they can use to wait for a class. However, its usage goes beyond this. We have found that the different activities can be categorised as follows: a) group work, b) socialising, c) private reflection, d) interaction with academic staff, and e) access to the University’s Career Development Centre. These points are discussed in detail in the next section.

The space is available during teaching time across Bond’s three semesters.

How is the space used?
There are five main ways that the space is used:

1. Group work activity
   One of the University’s key educational strategies is to foster cooperation and collaboration amongst students on project work and assignments. In many subjects, group assignments are very important and form a large part of the final grade. However, until recently, there were very few specifically designed places on campus where students could meet to work together in groups. The Street with its "L" shaped couches facilitates these activities, and accompanying tables provide a good venue for students to meet and to work collaboratively.

Please help us to evaluate and improve the spaces on campus by taking a few minutes to complete this survey.

1. What faculty are you from? □ BTSD □ HSM □ HSS □ Law
2. Are you: □ Undergraduate □ Postgraduate
3. Have you used either The Street or the MLC? □ Yes □ No, please continue to question 14
4. How many times a week do you use this space:
   □ MLC □ The Street
   □ Never Used □ 1 □ 2-4 □ 4-6 □ 7-10 □ >10
5. How long did you use the space?
   □ MLC □ The Street
   □ Never Used □ <30mins □ 1hr □ 2hrs □ >2hrs
6. What did you use the area for?
   □ Individual study □ Group study □ Meet with friends □ Taking a break
   □ Wireless Network □ Computers/Game Consoles □ Other, please specify ______________
7. How did this space meet your requirements/expectations?
   □ MLC □ The Street
   □ (Not at all) □ (Adequately) □ (Very much)
   □ 1 □ 2 □ 3 □ 4 □ 5
8. Did you need assistance/or help when you used the area?
   □ MLC □ The Street
   □ Yes □ No □ Please Comment _______________________
9. What do you like most about either area (circle)?
   □ MLC □ The Street
10. What would you like to see changed or added to either area (circle)?
    □ MLC □ The Street
11. Would you recommend these areas to other students?
    □ MLC □ The Street
    □ Yes □ No □ If No, why? ______________
12. Where else on campus would a ‘Street’ like area be useful?
13. Any further comments? ______________
14. Why haven’t you used these areas?
    □ Doesn’t meet my requirements □ Didn’t know they existed □ Other ______________
15. Do you plan on using these areas in the future?
    □ MLC □ The Street
    □ Yes □ No

Thank you for participating in this survey.

Figure 5. Web-based survey on The Street and MLC spaces
Q. Have you used either The Street area or the Multimedia Learning Centre (MLC)?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
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<td>255</td>
</tr>
<tr>
<td>No</td>
<td>10.2%</td>
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answered question 284
skipped question 0

Q. How many times a week do you use this space?

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<th>Answer Options</th>
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<th>1</th>
<th>2-4</th>
<th>4-6</th>
<th>7-10</th>
<th>&gt;10</th>
<th>Response Count</th>
</tr>
</thead>
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<tr>
<td>The Street</td>
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<td>86</td>
<td>52</td>
<td>18</td>
<td>2</td>
<td>1</td>
<td>222</td>
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</table>

answered question 244
skipped question 40

Q. How long did you use this space?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Never Used</th>
<th>&lt;30 minutes</th>
<th>1hr</th>
<th>2hr</th>
<th>&gt;2hrs</th>
<th>Response Count</th>
</tr>
</thead>
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<td>74</td>
<td>55</td>
<td>13</td>
<td>16</td>
<td>204</td>
</tr>
</tbody>
</table>

answered question 244
skipped question 40

Q. Did this space meet your requirements/expectations?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>N/A</th>
<th>Average</th>
<th>Response Count</th>
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<tbody>
<tr>
<td>MLC</td>
<td>5</td>
<td>10</td>
<td>21</td>
<td>63</td>
<td>122</td>
<td>18</td>
<td>43</td>
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<td>The Street</td>
<td>7</td>
<td>8</td>
<td>30</td>
<td>84</td>
<td>46</td>
<td>43</td>
<td>3.88</td>
<td>218</td>
</tr>
</tbody>
</table>

answered question 242
skipped question 42

Q. Would you recommend The Street area to other students?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>83.5%</td>
<td>172</td>
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<tr>
<td>No, Please comment</td>
<td>16.5%</td>
<td>34</td>
</tr>
</tbody>
</table>

answered question 206
skipped question 78

The use of wireless notebook computers means that access to the Internet and a range of University information sources is assured. Additionally, no noise restrictions are imposed.

2. Socialisation

Before, between and after classes, students will come to The Street to relax and catch up with their friends. A café is in the near vicinity. Often students will bring coffee and food to the area as well.

3. Private moments

Some students simply come to The Street to relax, work or read in the large comfortable couches.

4. Interaction with staff

Sometimes it is simply not possible for students to have all their questions answered in class time. Lecturers and tutors regularly meet with students in The Street to continue their discussions.

5. Career development

Located beside the Street is Bond’s Career Development Centre (CDC). This is a service that students use for post-university career advice, and gaining part-time employment during their studies. The staff of CDC use this area to consult with students as well as to display and distribute career materials.

How is technology used?

The Street was deliberately designed to have little technology. Only electrical power points and computer wireless access are provided. Our idea was to minimise the technology so that students and staff can interact in groups or simply be left alone to their own thoughts. There are many places across the campus (the Multimedia Learning Centre being a prime example) that give students access to state-of-the-art technology and the ability to communicate electronically. Areas like The Street help to keep the balance between the personal and the electronic.

Figure 6. Some results of the survey relevant to the Street.
Many students use the wireless support. At any given time, approximately 70 - 80 percent of the students will be working on their notebook computers. Surprisingly, there is little call for access to power. Perhaps this is because of computers’ extended battery lives and the fact the students will spend only a short amount of time in The Street, or a combination of these two factors.

How was the facility evaluated?

There have been two types of evaluation of this facility conducted, informal and formal. Informal evaluation involves occasional viewing of this area by the designers. We have found that it is heavily used each day during normal teaching time. In fact, it can often be difficult for students to find a spare place on the couches or ottomans. In some cases, students have resorted to sitting on top of the backs of the couches or sitting on the carpeted floor. Our informal observations have led us to believe that it has been too popular, and that we need to extend the area and the concept of these types of area throughout the University Centre. To this end, a new project is underway for a similar area that also includes a coffee shop.

A more formal evaluation approach has taken the form of a web-based survey which combined questions on both the Street space and the new Multi-Media Learning Centre (MLC) (see related case study) on the campus. Figure 5 shows a copy of this survey.

The results of the survey showed that students enjoyed having a comfortable area that they could freely access in between classes. Additionally, the convenience of being able to wait, read email, have access to power (for mobile devices) and perhaps have a snack made the area very appealing. The major criticisms were that it was not opened 24 hours a day, that the area should be extended and the ambient noise be damped.

Figure 6 shows some of the survey results (those directly relevant to The Street). A relatively large number of students, 284, responded to the survey.

What were the main lessons learned?

Both formal and informal evaluations have indicated that students need dedicated “breakout” spaces available on campus. This sounds intuitive and reasonable, but until recently, very little of this type of space has been available. By having facilities such as The Street on campus, students are encouraged to stay between classes – leading to greater informal learning experiences and increased socialisation opportunities. Naturally, additionally spaces of this kind are being currently planned.

Acknowledgements

There are a number of people and departments, without whom, the refurbished Street would not have been possible. These are (in no particular order):

- Facilities Management, in particular Cathy Murray (Director of Campus Operations)
- Information Services, in particular Mark Sutherland (Associate Director, Information Services)
- Bond University’s Teaching and Learning Committee, and, in particular, the former Pro-Vice Chancellor, Professor Duncan Bentley.
TELL us all about it: Establishment of a Technology Enhanced Learning Laboratory

What it is?

The Technology Enhanced Learning Laboratory (TELL), formally introduced to the University of Southern Queensland (USQ) community in early 2008, is a physical, multi-purpose space located in an area previously used as a television studio. The first iteration of the TELL has been created on a “lightweight” budget relying predominantly on the updating or relocating of existing infrastructure, hardware and software. However, as with a project described by Tom, Voss and Scheetz (2008, 42), even with a limited budget, this experimental space needs to guide USQ in “evolving new approaches to learning appropriate to our context”.

The space is located in a building that houses the University Learning and Teaching Support Unit and is associated with the USQ Australian Digital Futures Institute (see http://www.usq.edu.au/adfi/tell.htm). The term “laboratory” has been chosen because it conveys a sense of innovation, newness, experimentation, prototyping and improved learning through the application of innovative pedagogy and the creative use of technology.

The Lab is quite different from existing physical learning spaces such as lecture theatres and ICT training rooms. It embraces the ‘next generation learning space’ concept by adopting an open plan, studio-style room, with flexible, configurable technologies and fittings. A seven-foot circular table fitted with Sunray workstations offers a choice of operating system (Windows and Linux) and image (USQ Staff or Student Lab) where three groups of three can work. This use of the work space for collaborative activity aligns with the findings from the MIT Technology-enabled Active Learning (TEAL) project (http://icampus.mit.edu/teal/).

The Lab includes an access grid that supports multi-point video conferencing and consists of an ensemble of resources including several multimedia large-format displays, presentation and interactive environments, and interfaces to Grid middleware. For some time, this technology was housed elsewhere on campus and was not used effectively. With its relocation to the TELL, the aim is to raise the profile of access grid and its role in supporting learning and teaching in dispersed locations. The TELL has Windows PC and Macintosh hardware, streaming Satellite TV to an LCD monitor, wireless network functionality and wireless tablet PCs. Power and fixed data points are supplied to tables across the space via ceiling umbilicals. The room includes an elevated observation deck with audio capability allowing unobtrusive observation of learning and teaching situations.

Why it is?

USQ is a regional, multi-campus institution with more than seventy-five percent of the twenty-six thousand students studying at a distance in local, national and international locations. Given the regional spread of students, the gap between the service provided to on-campus and off-campus students has to be considered. To reduce this gap and also support the investigation of innovative approaches to learning and teaching, the concept of the TELL was conceived. The concept aligns with the University Vision to improve learning.
and increase access through the creative use of technology. The TELL also supports the flexible learning priorities identified in the Learning and Teaching Operational Plan 2007-2012 which states that USQ is committed to “flexible modes of program delivery, both on and off-campus, including technology-supported and online learning as well as quality classroom teaching” (http://www.usq.edu.au/resources/ltplan.pdf).

A proposal for a technology enhanced “sandpit”, submitted in August 2006 by two academics in the Faculty of Education (Dr Shirley Reushle and Associate Professor Peter Albion) to the Chief Technical Officer, Division of ICT Services marked the beginning of planning for the TELL. Soon after, a small reference group was formed consisting of the CTO (Brian Kissell), the Principal Advisor, Learning and Teaching in the Division of ICT Services (position also held by Dr Reushle) and two members of the Learning and Teaching Support Unit. This group participated in several brainstorming and planning sessions to determine the purpose, design principles and functionality of the space. However, due to limited funds being available, the project did not move forward until early the following year when initial plans were drawn up and quotes requested for hardware and software configurations. The official opening of the TELL occurred in February 2008. The concept plans at proposal stage are shown in Figures 2 and 3.

The design principles that guided the development of this learning space reflect many of those put forward by Tom et al. (2008). The principles suggest that the space must:

- Be flexible to accommodate differences in discipline, learning and teaching requirements and activities;
- Have interfaces that are user-friendly and intuitive;
- Provide social spaces that enable collaboration and other interactive activities;
- Address creature comforts and ambience.

According to Jamieson (2008), people create identity through their association with space. He also points out that sometimes it is important to reduce rather than fill every space – to keep some space empty to accommodate “possibilities”.

- Ensure that equipment, facilities and furniture are accessible to both teachers and learners. Trialling of technologies to increase accessibility for those with visual and hearing impairments and other disabilities provide important avenues for further exploration. Key to the TELL should be the concepts of inclusivity and accessibility.

The concept and design of the space has drawn on pedagogical principles related to the theories of adult learning and constructivism that together place the user at the centre of the learning process. The design acknowledges that adults have a wealth of experience on which to draw and that the focus should be on providing authentic activity that is task-centred, practical and with immediate application to the user’s (learner’s) work. The design takes into account the self-directedness of adult
learners who can usually identify their needs, prefer flexibility, but need some structure and support. In addition, experiences that are isolated and unrelated to the “now” can be irrelevant for these learners. Adults also need to be able to reflect – on the activity, on the learning environment, on their interactions with others and then relate it to what they already know and do.

What happens here?
Use of technology-enhanced learning spaces at USQ has, until recently, focused on on-campus teaching and the use of videoconferencing to link the Toowoomba campus with its two other campuses located at Fraser Coast and Springfield. The intent of the TELL is to encourage USQ teachers to think beyond this and be given the opportunity to easily access and trial other potential technology solutions.

The TELL provides a space where staff can explore the pedagogical aspects of learning and teaching technologies and be challenged to rethink the possibilities in using a physical space with technological enhancements. It provides an experimental prototype, ICT-enabled environment for exploring the effective use of ICT and to link USQ staff and students at remote locations. It also aims to create a visible and high profile environment for ICT innovation and exploration and to provide a proof of concept space for future deployment into learning and teaching environments.

The experimental research and development intent of the TELL suggests that the space should not be used for regular timetabled classes as the aim is to make it available for trial-based activity through an electronic booking system. However, teaching staff are encouraged to trial the efficacy of the TELL with their own “real” classes with the intention of deploying successful ideas into mainstream activity and other teaching spaces in the University.

During semester 2, 2008, two academic staff members were awarded Learning and Teaching Fellowships. Part of their respective projects include trialing software and hardware in the TELL with the intention of documenting effective means of using learning spaces and technology to enhance learning and teaching. In addition, industry partners are being actively sought to support the refresh of infrastructure.

How is the space and technology used?
It is early days in terms of the regular use of this space by teachers at USQ. Now that an online booking system is in place and more teachers are becoming aware of the space and its potential uses, the expectation is that its usage will increase. Figure 4 shows the room being used for a brainstorming and training session. Recently, a
How was the facility evaluated?

Many “flexible” classroom designs are now in operation around the globe but often assertions of effectiveness are not accompanied by evidence.

A qualitative action research method originally developed by Salmon (2002) and adapted by Reushle (2005) is being used to frame the design and conduct of the trial of the TELL. This method (Figure 8) provides an iterative, cyclical process to develop, implement, evaluate, and modify the trial process and make recommendations for future action.

At this point in time, Phase 1 is underway and no formal evaluative data have been collected. Anecdotal comments through discussions held with several groups of stakeholders in informal focus groups (USQ teachers, ICT support personnel and managers) have indicated that the acceptance and successful uptake of the TELL will be influenced by:

- Institutional buy-in;
- Ease of use;
- Sustainable support structures (including ICT and pedagogical); and
- Evidence of pedagogical enhancement.

Powell, Single, and Lloyd (1996, p. 499) define a focus group as “a group of individuals selected and assembled...to discuss and comment on, from personal experience, the topic that is the subject of the research”. The main purpose of conducting these informal focus groups at this stage was to offer an open forum to draw upon participants’ attitudes, feelings, beliefs, experiences, and reactions to the TELL concept and space design.

The need to collect both qualitative and quantitative data to demonstrate that this kind of investment can pay off in improved learning outcomes is an important institutional requirement. As part of the Learning and Teaching Fellowships previously mentioned, formal evaluation plans are required but are not yet available.

What were the main lessons learned?

Despite the relative newness of this project, a number of recommendations have emerged from an initial, informal evaluation of the TELL initiative conducted through focus groups. These include:

1. The space should be an enabler of change and not perpetuate the traditional classroom model.
2. Teachers must drive the space – they need to see a reason for its “being” – a motivation to use and continue to re-use the space is essential to ensure its sustainability. This learning space should not just be regarded as a group of technologies. Learning should be at the centre of learning space design and this space should assist in showing off what USQ can do in terms of learning and teaching.
3. Who owns the space? For a successful, sustainable project such as the TELL, a formal project management process needs to be in place and implemented. This includes allocating a project “champion” as well as a Manager of an operational unit within the university who assumes operational responsibility for scheduling, managing of resources, maintenance, promotion of the concept, etc.
4. The sponsor must be responsive to proposals for updated technologies and new technologies. Teachers will need support as they think of new ways to use the facilities.
5. A formal scheduling/timetabling process needs to be in place and efficiently managed.
6. The mix of interfaces should be user-friendly and simple to understand. Planning for and using the space should not be an onerous task with innovative pedagogy supported by technology, not hindered by it.
7. Effective promotion of the learning space is essential as well as opportunities for showcasing innovation. A promotional video of the learning space has been produced.

8. Responsive technical support is essential as well as advice on how to use the technologies effectively.

As mentioned at the beginning of this paper, the term “laboratory” has been chosen because it conveys a sense of innovation, adventure and supporting new ways of thinking and doing. These are high expectations of a single room renovation but our hope is that the efforts of the University community with turn this room into an effective and innovative learning space.

Acknowledgements

The creation of the TELL has involved a range of stakeholders. The concept of the TELL emerged from an initial proposal prepared by Dr Shirley Reushle and Associate Professor Peter Albion from the Faculty of Education. Mr Brian Kissell, Chief Technology Officer, Division of ICT Services progressed the concept through Division of ICT staff including David King, Stuart Cornford, Colin Glasby, Michael Beveridge, Stuart Gibbs, James Page, Ray Smythe and Chris de Byl.

References


TELL us all about it: Establishment of a Technology Enhanced Learning Laboratory
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.

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 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. Ordinarily, 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.

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,
those being:

1. Cooperation among students, and
2. Active learning

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 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 reporting that the ELC was beneficial to their learning experience in the FYELC, students agreed that the centre strength relationships – sort of like weight lifters as the likelihood of finding another student who is doing the same course is very high. A student commented: “Everyone surrounding you is a first year engineer. It means that whenever you turn up there are people who know what assignments you are doing and they are willing to help”.

In terms of frequency of usage, 65 percent of students reported frequent use as illustrated in Table 1. (“most weeks” 14 percent, “every week” 23 percent and “most days” 27 percent), with only 8 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 and 10 hours per week Table 2. ("most weeks" 14 percent, "every week" 23 percent and "most days" 27 percent), with only 8 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.

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”, 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”. 

Table 1: Frequency of Student Use. Table 2: Hours spent per week. Table 3: Overall 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.

Acknowledgements

The creation of the First Year Engineering Learning Centre has involved a range of stakeholders. The FYELC was initially proposed by Professor Ian Cameron and Professor Caroline Crosthwaite. Professor Michael Keniger (Senior DVC UQ) has provided ongoing support for the development and continuing operation of the centre. Hamilton Wilson, the Managing Director of Wilson Architects, provided the authors the plans and input into the FYELC case study.

References:


What it is?

The Multimedia Learning Centre (MLC) is located in the northern wing of the main Arch Building on the Bond University campus. The facility functions as an environment for extended learning experiences for all Bond students, as well as a digital gallery for the projection of multimedia high art and the use of computer gaming technology. It is managed and staffed centrally by Information Services (Library and ICT) and this is one of its key distinguishing factors.

There are a number of zones in the centre including a social learning zone, group oriented study booths, individual computer stations, tables with provision for students to work in pairs where extra chairs are provided, as well as an enclosed Collaborative Learning Room (CLR) with complete AV fit-out. The social zone includes lounge seating with easy access to power outlets as well as a Laptop Bar. A concierge style kiosk that is staffed at all times provides support and information for students as well as loans of peripheral equipment for use in the booths, CLR and at the computers.

The facility was built as part of a project that included the construction of two mezzanine levels in the former art gallery space. The mezzanine levels are used as teaching spaces for the Faculty of Humanities and Social Sciences and are not part of the Centre. The entire project including the mezzanine levels cost around M$3.4. This also includes costs associated with new building code compliance, given that the building had not been refurbished since original construction around 1988, as well as a significant technology cost component. Construction of the 500m2 facility began in November 2007 and was completed in early April 2008 with students using the facility by the start of Bond's second semester in early May. Shortly before opening, the centre was named The Balnaves Foundation Multimedia Learning Centre.

Why it is?

The existing art gallery at Bond University was essentially a “dead space” in a prominent and central building on the campus. Since its inception it was difficult to use as an art gallery or for holding functions as there were significant issues regarding reverberation and lighting. Initially it was thought the space would be good for a 24-hour “study hall” with tables and chairs and computers. However, the Main Library at Bond University had in recent years undergone an incremental transformation into an unplanned but very well used learning environment and this was increasingly observed and acknowledged across the campus. As a result the gallery space was identified as being suitable for an extension of the Main Library’s learning environment but with updated technology and furniture to meet the changing needs and learning behaviour of students.

At the same time, the need was identified for a suitable space to project student digital art as well as to provide facilities for students enrolled in Bond’s Bachelor of Computer Games program. These concepts were therefore brought together in a single brief to architects. A number of architects were invited to put forward proposals for the refurbishment of the gallery space on...
The pedagogical principles that drove the design included provision of extended learning opportunities, peer-to-peer learning, partially structured learning and collaborative learning.

What happens here?

In this section the broad pedagogical intent for the facility is discussed and in the section on space below, the pedagogy-space-technology rubric is detailed under the heading for each zone in the MLC. During Bond’s 3-semester year, the MLC is open 18 hours per weekday from 7am to 1am and 15 hours on each Saturday and Sunday from 8am to 11pm, thus a total of 120 hours per week. Essentially, extended learning occurs here as the learning experience that starts in the lecture or tutorial extends into peer-to-peer and collaborative learning with students engaging in the following:

- Discussing assignments and projects
- Working on assignments in individual, pair or group mode
- Experimenting with technology for group work – digital presenters/document cameras, webcams, gaming technology
- Viewing of digital high art produced by students and projected onto the high parts of the walls on one side of the gallery

Each of the zones or spaces in the MLC is designed to support different student behaviours and different cohort sizes, broadly falling into three categories:

- Introvert: Focused quiet study (although this is an open space focus has been created by design and layout)
- Exhibitionist: Active extrovert space, particularly in the social learning zone
- Voyeur: Passive engagement with other people or aspects of the overall space

this basis and Wilson Architects secured the commission.

The initial concept for the space was to build on ideas developed for the First Year Engineering Learning Centre at the University of Queensland that is predominantly a peer-to-peer social learning space. A significant aim in the design of this space was to enable extended learning experiences. The original proposal to convert offices on the same level as the Bond Art Gallery into collaborative teaching and learning spaces would have created a logical extension for this space. However, this strategy has been deferred until more office space can be found for the Faculty of Humanities & Social Sciences. Since the Multimedia Learning Centre is managed by Information Services (Library and ICT) and being both centrally located and close to the Main and Law libraries, the possibilities for campus social learning coordination and support are considerably enhanced.

The key players involved in the concept planning and gathering of support were the Director of Information Services who had long lobbied for refurbishment of the Main Library essentially to accommodate more learning spaces and senior executive staff including the Pro-Vice-Chancellor, Information, the Vice-Chancellor, the Director of Finance & Projects as well as key members of the University Council including the Chancellor. In the design stage and collaboration with the architects and consultants, the key players were senior Information Services staff, the Head of the School of Communication and Media in the Faculty of Humanities & Social Sciences and other staff on a consultative basis, including staff from Facilities Management.

Critical decisions were made by the University Council specifically in terms of approving and funding the creation of the new space as well as by the Vice-Chancellor and Director of Finance & Projects. Other decisions relating to technology, furniture and layout were made as the project unfolded by the Director of Information Services and Associate Director, Information (Corporate Services) in consultation with both senior management and other stakeholders on campus, including students. The Library’s customer engagement strategies of holding face-to-face roundtable discussions with students played a key part in incorporating their input into the design of the space.
How is the space used?

Essentially the space presents a number of options for social learning engagement. As part of the design it was important to enable students to ‘hyperlink’ between various learning spaces and modes and this is reflected in the various zones or areas as shown in this floor plan and detailed below. Actual use is compared with intended use in the section dealing with evaluation of the space.

The space was designed to ensure visual engagement by the users with the inside and the outside – additional windows were created to engage with the courtyard outside and at the rear of the centre the building was opened up to provide a spectacular view of the campus lake and Fountain of Learning. The acoustics of the space were dramatically improved through the use of acoustic battens across the ceiling and parts of the internal walls.

The furniture was designed to ensure comfort and support a variety of learning modes. At some tables two chairs have been provided for a single computer with sufficient desk space for two students to work together on the computer. This also ensures that there are more chairs available than simply one for each computer and provides the flexibility for pairs and groups to be formed easily as required.

1. **Entry/Foyer**
   - Pedagogical intent: Instructional display with touch-screen monitor as well as campus wide digital signage
   - Space design: Comfortable ottoman for students to wait for friends and to engage with passing traffic and information displays
   - Technology: Large screen LCD, campus-wide information coordinated by Information Services (Library and ICT), campus telephone for students to contact lecturers

2. **Laptop Bar**
   - Pedagogical intent: Social learning, casual drop-in, quick research or touching up of assignments
   - Space design: Close to the entry, toilets and vending machines, this bar was designed for short term use by students in between classes. The short term stay overlooking the other learning spaces supports the behaviour preferences of the voyeur and exhibitionist. The colour of the bar changes to reflect potential different learning moods.
   - Technology: Power for laptops and wireless connectivity

3. **Lounge seating**
   - Pedagogical intent: Social learning, flexible furniture to support group work with laptops as well as print based material.
   - Space design: To support cohorts of four - eight with comfortable casual furniture for longer study sessions. Caters for both more focussed introvert behaviour as well as extrovert behaviour within groups
   - Technology: Power for laptops underneath seating and wireless connectivity

4. **Study Booths**
   - Pedagogical intent: Open collaborative learning
   - Space design: Booths for a cohort of four - six. Comfortable casual furniture for longer working sessions. More focused introvert behaviour within groups and with the study practice on display for others to engage which encourages the extrovert and voyeur
   - Technology: 40inch LCD screen with networked computer, wireless keyboard and mouse; document camera to capture print material; ability to connect a laptops to the large LCD screen; ability to view DVDs and play computer games using the PlayStation3 console; power for laptops without using the LCD screen and wireless connectivity

5. **Open Computer tables**
   - Pedagogical intent: Reflective 70 percent, collaborative 30 percent modes of study
   - Space design: Open study workstations to support one to two students at each computer. The colour of the bar changes to reflect potential different learning moods
   - Technology: Networked computer workstations with 20" wide screen monitors – cable management in centre of tables

6. **Individual Computer stations with a view**
   - Pedagogical intent: Reflective modes of study
   - Space design: Students working with back to open space facing landscape view of lake and campus environs. Introvert behaviour for one to two students to enable more focussed work
   - Technology: Networked computer workstations with 20" wide screen monitors
adequately spaced to allow for additional materials to be placed alongside

7. Collaborative Learning Room

- Pedagogical intent: Collaborative learning space enclosed for quiet focused work within groups
- Space design: Boardroom-style table supports a cohort of eight to ten with room for an additional 14 along bench seating at the edges of the room. Extensive use of glass enables passive engagement with activity occurring in the room
- Technology: Smartboard, HD projector, videoconferencing, gaming hardware and software for Computer Games and Multimedia students (Xbox, Playstation, Nintendo Wii), laptop plug-in facility

8. Art displays and viewing

- Pedagogical intent: Passive engagement with the digital art projected onto large wall
- Space design: Can be viewed throughout space but additional seating is provided on opposite wall
- Technology: High resolution digital projectors configured as a group of 3 images in landscape format

9. Service Kiosk

- Pedagogical intent: Instructional. Learning support staff managed by Information Services (Library and ICT) able to assist with information, IT/AV support and peripheral equipment loans
- Space design: Centrally located stand-up support desk backed up with storage cupboard for IT/AV peripheral equipment
- Technology: Staff computer with barcode scanner, cordless telephone to enable staff to move around the facility and assist students, Xpanel for control of lighting, projection equipment and sound levels in the study booths, microphone for PA system announcements

The unique or noteworthy aspects of the Multimedia Learning Centre include:
- The projection of digital art within the learning environment
- Mood lighting in the modern furniture
- Gaming consoles in the study booths and Collaborative Learning Room
- The fact that the facility is managed by Information Services (Library and ICT) and is staffed during all opening hours
- The high ceiling (triple volume) in the centre provides extensive headroom and white space, making the environment conducive to creativity and learning.

How was the facility evaluated?

The MLC was evaluated using a variety of methods including:
- Paper-based exit survey during the Weeks 1-4 of operation
- Online survey during Weeks 5-7.
- Library blog, the L Files , used to gather comments from students

Usage of the facility has also been measured using electronic people counters and comparing this to visit statistics for the libraries. Although these instruments provide data indicating that the facility is being used as intended, a formal post-occupancy evaluation of the space has not been undertaken yet. As the MLC has only been open for just over two months at the time of writing, the full picture can only be seen once further evaluation has been undertaken.

How is technology used?

The technology has been discussed above in terms of the pedagogy-space-technology rubric for each zone in the MLC. This section features some broad comments about the technology in general. Technology is used in various ways throughout the centre, depending on the type of zone and the furniture provided. Wireless connectivity is ubiquitous so laptop use extends throughout the facility in areas where power outlets have been purposely provided as well as in other areas such as at tables in between desktop computers.

The study booth zone is the most technology rich part of the space. Early use of these booths seemed to be mainly for computer games. However, as the semester progressed, this gradually declined and the booths have been used with and without technology by small and larger groups alike. In particular, groups gather around the large LCD screen to collaboratively work on assignments using either a plugged in laptop or the networked computer with wireless keyboard and mouse.

Bond University has a comparatively high laptop ownership ratio with more than 85 percent of students reporting that they owned their own laptop in a survey in 2007. This is evidenced in the way the MLC is used as many students bring their own technology into the space. This was considered in the design and ample provision was made for power outlets for laptop use.

Networked printing facilities from both desktops and wirelessly from laptops are available in the MLC and well used by students.
Exit Survey: During weeks one to four of the semester, students were encouraged to complete a quick paper based questionnaire to gauge their impressions and obtain initial feedback on the new facility. A total of 300 responses were received, 210 undergraduate and 90 postgraduate, across all four faculties but predominantly from the Faculty of Humanities & Social Sciences. Considering that Bond has a student population of around 3,600, this was a good response. Students were asked to indicate on a floor plan which zones they had been using. The zones in order of popularity were:

1. Group tables with desktop computers
2. Study booths for groups
3. Social learning area
4. Laptop bar
5. Bench with individual desktop computers
6. Banquet seating with view of digital art
7. Collaborative Learning Room
8. Foyer

When asked what they were doing before using the MLC, 57 percent, indicated that they had been at a lecture or tutorial. With regard to their next port of call after using the MLC, a similar percentage (58 percent) indicated that they were going to a lecture or tutorial. These figures serve to reinforce the fact that the MLC is being used primarily as a place for extended learning or transitional learning between structured learning sessions. The majority of students indicated that they had worked in pairs or groups of up to five during their visit to the MLC.

Around 37 percent indicated that they purposefully chose their selected place in the centre based on preference while around 30 percent did so because of the appropriateness of technology and 20 percent because their friends were already in the particular zone. A very small minority indicated that it was “the only place they could find to study” which provides evidence that the space is catering for what students are looking for. Just over 50 percent of students surveyed said that they were working on an assignment while in the MLC while 23 percent were just meeting friends. Almost 60 percent of students indicated that they were at the beginning of an assignment rather than in the middle or near the end probably because the survey was conducted at the beginning of semester. Approximately half of the students said they were using a laptop and the other half a desktop computer. Only 7 percent were using gaming technology and only 2 percent document cameras.

Online Survey: This survey was conducted for a period of three weeks after the conclusion of the exit surveys. It covered both the MLC and another new extended learning environment on the Bond Campus known as The Street. Some 284 responses were received of which the undergraduate to postgraduate split was approximately 68 percent to 32 percent. Only 10 percent of respondents said they had not yet made use of the MLC. 30 percent indicated they used the facility once per week; 38 percent 2-4 times; 16 percent 4-6 times and 5 percent 7-10 times with 3 percent using it more than 10 times per week. In terms of the length of time spent in the facility each visit, 28 percent spent more than 2 hours while 51 percent spent 1-2 hours and 14 percent less than half an hour.

When asked what they primarily did when visiting the MLC, students responded as follows: 76 percent had used it for individual study at times; 54 percent had used it for group study; 44 percent to meet friends; 41 percent just to take a break. In terms of the technology used, 48 percent had used the wireless LAN and the same percentage had used the desktop computers. Interestingly, only 16 percent indicated that they had used the games consoles.

In terms of overall satisfaction with the space, 51 percent of students strongly agreed and 26 percent agreed that the centre met their requirements/expectations, revealing that overall satisfaction was experienced by 77 percent of students. Two percent felt the facility did not meet their needs at all and 8 percent were indifferent. 83 percent of students stated that they did not require any assistance while in the centre while the remainder did.

When asked what they liked most about the MLC, the majority of students said the computer access, lots of chairs and the comfort and layout for group work. The modern look and feel and “funkiness” also rated highly.

In conclusion, 93 percent of students indicated that they would recommend the MLC to other students and 80 percent said they intended to use the facility again in the future.

Blog and survey comments: Although well publicised and encouraged, very few students left comments on the MLC on the Library’s blog, The L Files. This is one of them:

“I am very impressed with the MLC, it is gorgeous and luxurious, a pleasure to study there. Thankyou I hope other students will respect the space - I saw someone eating noodle box noodles in there - nobody needs hoisin sauce on the new keyboards!”

Other significant comments from the online survey:

“As students we are so privileged to have the use of such amazing facilities. Both the Street and the MLC have been designed in the students’ best interests and are world class. Paying higher university fees is definitely worth it when we receive facilities like these. Thank you”

“The MLC is so fantastic – I find myself going there just to do work rather than at home because I enjoy the environment”

“The MLC is brilliant – they way it is designed space-wise is really neat. The materials used …. etc is very nice”

Not everyone agreed, though:

“I think this new space is absolutely unnecessary
and a waste of money”

Comments from a number of students also indicated that the concept of social learning as opposed to old-fashioned studious learning is not understood by all with some believing the facility should be quiet with no “fun” activities or social chatting.

Visit statistics:

In the first three weeks after opening, 20,691 visits were recorded while the following month, June, this rose to 32,668. When compared to the Main Library’s 43,918 and the Law Library’s 21,405 the two libraries together only showed a 1 percent decrease in visits over the previous year indicating that students are still visiting both libraries despite the availability of the MLC. More than likely many of those who never frequented the libraries are now using the MLC.

What were the main lessons learned?

In the short time that the Multimedia Learning Centre has been open, a number of key lessons have been learned all of which reflect one or more aspects of the pedagogy-space-technology rubric:

- The entry space was initially not used much. Some of the reasons for this were related to the fact that the digital display monitor was only operational some time after opening and at the time of writing, the touch-screen monitor is still not working. As such, there was not really anything to make the students stop and sit down in the area

- Laptop bar: this area was initially not well-used until signs were placed prominently indicating what it was designed for and that power-points were available below the edge of the bar as these were not clearly visible. Having power outlets underneath is also a problem with regard to cords becoming entangled with stools, etc.

- The idea of a concierge style service kiosk where the staff member would stand at times but rove around and help students most of the time is still taking off with staff being encouraged to “create work for themselves” by weaving in and out of the various zones in the space and checking if students need help and or demonstrating some of the newer technologies such as the Crestron controllers and digital presenters.

- It very soon became apparent that students wanted to plug laptops in at places where no power outlets had been provided, such as in between desktop computers. As a result, students began unplugging equipment in order to use their own.

- Some of the furniture is not being used as intended. However this does not appear to be too much of a problem – students like to sit on the timber bench meant for their feet! Unless the intended design of the seats can be demonstrated to students, they will continue to use furniture as they think fit.

- A “wait and see what happens” approach was taken in relation to the handling of the gaming technology in the centre and this has proven the right approach. The lesson learned is that it is not always necessary to open a new facility with rules and regulations in place – some must be allowed to develop organically. Although there were initially some complaints about too much social gaming as opposed to academic gaming, as mentioned, this has settled down and social gaming now seems to be mainly undertaken in the early part of semester while gaming students engage in academic gaming throughout semester.

Acknowledgements

The creation of the Multimedia Learning Centre has involved a range of stakeholders. Significant acknowledgement is due to the Chancellor of Bond University, Trevor Rowe and Council members, in particular Neil Balnaves; Vice-Chancellor and President, Prof Robert Stabile; Deputy Vice-Chancellor and Provost, Prof Garry Marchant; Director of Finance & Projects, John LeLievre; Director of Information Services, Gulcin Cribb and senior Information Services staff; Dean of the Faculty of Humanities & Social Sciences, Prof Raoul Mortley; Head of the School of Communication & Media, Prof Jeff Brand; Hamilton Wilson and Brent Hardcastle of Wilson Architects; and Matthew Bedford and staff of ADCO Constructions.
The Learning Lab: Transforming a Learning Experience

What it is?
The Learning Lab at the University of Melbourne is designed to support active group and collaborative approaches to teaching and learning, integrated with seamless access to information and presentation technologies. The Learning Lab is used by around 1200 first year chemistry students on a weekly basis in classes of around 40.

Why it is?
First year chemistry at the University of Melbourne consists of a suite of subjects, taken by students who major in all of the sciences, as well as others in engineering, medical and health sciences, veterinary science, commerce and arts. The total enrolment in these streams is typically 1100 to 1400 students in any semester. These large subjects have a ‘traditional’ teaching structure of three large group lectures a week, six to eight half-day lab classes a semester, and a one-hour problem-solving tutorial class each week.

Providing effective personal feedback in large classes and supporting students to be part of a learning community, especially when they come from diverse enrolment cohorts, is a major challenge. The weekly problem-tutorial classes provided the best opportunity to address these issues, but any attempt to change the modes of learning there was severely limited by the lecture theatre spaces in which they were normally held. The West Theatre in Chemistry was a small theatre able to accommodate up to 90, typically there were 35 – 50 students in the tutorial classes held there. The Learning Lab is the result of the demolition, redesign and reoccupation of this space.

What happens here?
In replacing our old first-year chemistry problem-tutorial classes, the design brief for the Learning Lab program was to

* Make group and active learning a central feature of our major first year subject streams
* Change the ways our teaching staff can work with individual students
* Develop students’ abilities in contributing to and presenting solutions to group tasks
* Enable presentation of science using a range of new technologies.
How is the space used?

The Learning Lab consists of five zones, each with a swivel desk arrangement for flexibility in grouping and each supported with a range of ICT and presentation tools. The space accommodates a class of up to 40 - arranged in five groups of up to eight students, or ten groups of four. The space has been designed over four levels, with the objective of meeting two criteria - accommodating the significant change in level between the inside and outside of the building, but more importantly, as a device to create the five individual and separate smaller group settings.

Each zone has IT access that includes group use of PCs, laptop points, external input sources, a document camera in each zone and a large LCD display that can be driven ‘centrally’ or be under the control of the zone group to share their work within the group or present to the other zone screens in the space.

By adjusting workloads and budget to be able to provide two staff - an experienced tutor, often a subject lecturer, and a post-graduate ‘class tutor’ - we have created a much more fluid and adaptable learning environment in these classes.

How is technology used?

Seamless access by students to computing, online resources and technology is a key feature of the Learning Lab - but the focus must be the learning not the technology. Here are some examples:

* Some tasks for student groups in the class require online access to electronic databases, e-journals and resources; Gathering the information as it is required and the problem solution that is enabled become part of the student task. These skills are becoming a valued feature of our students’ undergraduate expectation and experience. In these situations, control of the zone LCD displays can be handed over to the student groups to use their own computer, document camera or other sources to share information within their group. Later these sources can be switched back to central control to share with the whole class, either via the zone LCDs or onto the projection screen in the Lab.

* ChemCAL Online is a suite of online interactive modules around topics that cover the entire first year chemistry syllabus; many of the pages are multi-layered screens where students encounter formative questions in a range of innovative styles, or animations illustrating key chemical ideas and experimental techniques. Use of animations from ChemCAL or other sources, are used in the Learning Lab program as a focus for active discussion and concept development by students.

* The safety induction in Week One uses QuickTime Virtual Reality (QTVR) movies that show good and bad laboratory practice in the laboratory that students will be working in during the next week. Students navigate this virtual space to identify and discuss issues related to appropriate and safe laboratory practice with their tutors and the students with whom they will be sharing the laboratory. Discussion is energetic, the approach is effective and feedback from staff and students, in contrast to the traditional ‘safety lecture’ pre-lab presentation, is very positive.

* The ‘Structural Analysis’ ChemCAL Online modules introduced into the Learning Lab program, are undertaken in student groups of three to four. Students build up the layers of information that are necessary to characterise a chemical ‘unknown’. The discussion and debate among the groups as their solutions develop have produced some of the most active sessions in the program so far.

* The Back to Reality Project has involved the development of facilities to enable ‘live’ yet safe chemical demonstrations by exploiting modern macro-video and projection technology. A suite of micro-scale demonstrations that are mapped to the
content of the course have been developed. There is no intention that these should replace students’ own laboratory experience and development of their material handling and manipulative skills; these are critical for a practicing scientist. The objective here is to provide an immediacy and engagement with the chemical process or observation ‘as it happens’ in the class.

* The use of Keepad ‘personal response systems’ in the Learning Lab has had a dramatic impact on student interest and engagement during these classes. Opening questions provide staff - and the class - with hard data about students’ prior knowledge. A brief closing check highlights what has been learned during the class - collective and anonymous data for the teacher, but individual and private feedback to their students.

* Web video conferencing is available from the Learning Lab. This can support remote collaboration or communication and input from researchers on site.

* From the staff perspective, appropriate technology has become part of effective teaching practice in the Learning Lab. The availability of multiple LCD and projection screens enables up to two video sources to be used - these could be, for example, the Zone 0 (staff zone) computer and their laptop, or the laptop and document camera, or computer and any source from one of the student zones.

The Learning Lab is a technologically rich space, but a key to its use as part of an effective learning experience is the appropriate use of this technology. Activities must make genuine use of it. If the technology is not necessary, it is not used. “Pen and paper” problem solving or learning to sketch and draw chemical structures, for example, and then discussing those efforts with peers and staff are also important features of our chemistry classes in the Lab.

**How was the facility evaluated?**

Evaluation is an ongoing aspect of the operation of the Learning Lab program. Staff development and support are vital to the successful use of the facility. This includes exploring the flexibility of the physical arrangements to suit their own teaching style or requirements, as well as layering in the use of the range of IT resources that are available. The learning curve for staff has been steep, but feedback from staff and from students has been very positive. As a simple initial measure, tutorial attendance, that typically would drop to 30-50 percent by mid-semester, was running at 70-90 percent in censuses in 2007 and 2008. Broad Quality of Teaching scores for the subjects and end of semester exam scores have each marginally improved - hardly yet a trend, but an encouraging signal.

The first formal stages of an external evaluation of the program are now being completed. Evaluation has involved interviews with focus groups of students and, on a much larger scale, using survey questionnaires, both early and later in students’ experience of the Learning Lab program. The evaluation process has involved focus group discussions with the different staff groups that make up the teaching team - tutorial staff, who carry the bulk of the class workload, lecturers in the subjects, who also give some Learning Lab tutorials in the parts of the subject in which they give lectures, post-graduate ‘class tutors’, and the staff responsible for coordinating and resourcing the Learning Lab program. These are now being followed up after a second year of experience in the space to discuss refinements and changes in teaching approach and reaction. More details of these studies will be presented.
Another facility that may play an important role in this review, development and evaluation process is the provision of remote video observation and recording that has been built into the Lab. This can be used for reflective analysis by staff, as records and examples of good practice and innovation, and as the basis of research analysis and evaluation in the use of the Lab for teaching and learning.

What were the main lessons learned?

The Learning Lab Project brought together resources and institutional support, established design experience and expertise, with academic input and commitment to curriculum change. The interplay between the design and curriculum groups was a critical factor in the creation and successful implementation of the space and the program.

Major curriculum change, especially in large and complex subjects, is most safely carried out as an incremental process. The interplay between the strands of learning activities can be subtle. Bad experiences for students - and for staff responsible for the subject - can be difficult to turn back. Pilot programs undertaken by staff willing to try them and share that experience, create confidence in the innovation for colleagues. The development and refinement of the Learning Lab program is an ongoing project.

While first year chemistry classes, by sheer weight of their numbers, are the major users of the Learning Lab, experience is developing in using the space for research workshops, professional development programs and undergraduate classes in a range of other disciplines. Sharing these experiences in an important element in understanding and exploiting the potential of the space.

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In parallel with the design and construction of the Learning Lab, there has been a full review and revision of the tutorial program that uses the space. The energy of Carmel Abrahams, Genevieve Adams, Sarah Harvey, Brendan Abrahams, Penny Commons and David McFadyen has been critical in this. The ongoing evaluation of the program is being carried out with the involvement of Kerri-Lee Harris and Chi Baik, from the Centre for the Study of Higher Education at The University of Melbourne.
What it is?

Bond University has recently completed construction of an engaging formal teaching space, known as the Pod Room, named as a result of its pod, or kidney-shaped, group work desks. The room has been designed to facilitate interactivity, teamwork, and sociability amongst students. Our concept of this pod space is based on an innovative design that has been successfully trialled at the University of Melbourne and the University of Queensland. Essentially a pod is an area consisting of a large group table, chairs, and computer system, in which a small group of students can work. Each pod naturally allows a team of students to work cooperatively on solving a problem. A classroom typically has four or five pods. The teacher controls the display system of all pods via a switching system, allowing students in all the pods to see either the same view (either from the teacher’s station or another pod), or their own view.

Figure 1 shows the plan of the pod room, while Figures 2 to 5 shows photos of the space from various angles.

Why is it?

The opportunities for students to work together and collectively solve problems are important features of assessment practice at the University. Until now, we have not had a formal teaching space in which group-oriented activities could easily occur. If group work was required in class time, often classroom furniture would need to be moved to accommodate, and computer access was via the lectern computer. For many teachers, this has been an understandably unsatisfactory arrangement. The Pod Room has been specifically designed to easily facilitate these activities.

What happens here?

Essentially this room is designed to accommodate blended learning activities, where information and communications technology is combined with face-to-face teaching using both group based and problem based learning exercises. In blended learning environments afforded by this Pod Room space, emphasis needs to be placed on:

- Redesign of the conventional face-to-face classroom activities to take advantage of the potential for interactivity that the technology-enhanced learning environment provides;
- Designing the online activities to take advantage of “time on task” and
- Creating opportunities for increased learner control of their learning using both group and team-based activities as well as time for independent learning (Skill & Young, 2002).

How is the space used?

A common activity is to set each group an exercise requiring the use of the pod-based computer where students can access information via the Internet and prepare information for presentation to other students and the teacher. During the activity time, the teacher can preview the work of each pod on the master pod computer (Figure 3). This can help to put the students in the right direction, or to stop students from wandering to sites other than those that are the focus of the class. At the end of the activity,
the teacher can display the solutions from each pod on the projector screen at the front of the room for class analysis and discussion.

The room also has informal breakout capacity in the form of several ottomans. This furniture can be pushed into any configuration and serve to allow groups to talk with one another, away from the pod area. Teachers are also using them to bring students together at the end of a class for a final discussion and overview of the learning that has taken place in that particular class. Whiteboards are provided along the sides of the room and are used to support discussion and summarising (Figure 3).

How is the technology used?

The technology is an integral, yet not overwhelming, part of the Pod Room. It has been designed as an affordance, or as a way of supporting the learning process, rather than something that is learned about, such as in training students to use a computer in a computer laboratory. In many ways this hides the fact that the Pod Room is a technologically sophisticated room. Its features can best be described in terms of two principle components—the master pod (Figure 3) and the group pods.

1. The Master Pod (Figure 3).

The master pod is the facilitator’s workspace and is used to control the entire room. These controls are completely inbuilt into a single touch panel (Figure 6). The technological features of the master pod include:

- All lighting. There are front and back house lights, as well as down lights for each pod. Each light can be controlled individually from the Master Pod.
- The two projectors. These are Mitsubishi HD4000 wide screen projectors. Figure 6 shows the on-screen controls.
- Image switching (Figure 6). Images from each pod (including the master pod) can be switched to any other pod or projector. This flexibility gives the room many of its educational advantages. The teacher/facilitator may also choose to preview the image on their screen first before putting to another device, such as a projector.
- Document camera. This is a Lumen DC160.
- DVD Player. This is Sony DVPSN78P.
- Touch Pen. The pen acts as a mouse and an annotation tool.
- External AV and Computer Input. The teacher can use their own computer and/or video equipment instead of the computers at each pod.

2. The Student Pods

Each pod has its own network enabled computer system with two 19" monitors (Figure 4). Like the master pod, there are facilities that allow students to connect their own computer to the pod. Additionally, a lighting control is mounted in each desk that allows the students to change the level of lighting directly over their pod.

How is the facility being evaluated?

A pilot program in the use of the Pod Room began in May 2008 and is continuing until the end of this year. This pilot involves a small group of six
teachers representing a spread of disciplines – Health Sciences, Languages, Town Planning, Teacher Education, and Information Technology. Throughout the pilot teachers are recording their thoughts, ideas and issues about their use of and student reaction to the Pod Room using a Blackboard Learning Community space. To date, one of the authors has observed four of the teachers using the Pod Room, and followed up that observation with an interview to focus on the details of how the room was used by the teacher during the observed class. In addition, students and teachers have completed a survey focused on their experiences of use of the learning space. Student survey questions have included:

- How has the design of the Pod Room space impacted on the way you have approached your learning in this subject?
- Has any aspect of the way you worked as student in this room stood out above all others? If so, please describe.
- What would you add/change/remove from the current Pod Room and why?

What are the main lessons being learned?

Based on information gathered to date from student and staff surveys and staff interviews, it is clear that the use of the room requires considerable planning on the part of the teacher. Careful attention to the design of the blended learning activities used in the space is essential to maximise the affordances of the technologies available and the design of the learning space. Technical difficulties in the space do occur, such as computer malfunctioning, and teachers have shown themselves to be quite resilient in dealing with these challenges.

Student reaction to the Pod Room through the student surveys has been mixed. Many have praised how the learning space has supported increased use of electronic media during classes, and made access to ICT tools easier, such as online dictionaries, and project planning tools. For time-poor students, being able to undertake research in class time has been seen as a positive in terms of being more time efficient than in a traditional classroom where individual computer research activity is limited. For many students the learning space has enhanced group work and interactivity with other students and their appreciation of the potential of the room to enhance their learning has increased during the semester as they and their teachers become more experienced in using the space. Other students have found the height of the computers at the individual pods distracting, and a few have even questioned whether their particular subject is best suited to being taught in this learning space. A small number of students have found that their interactions with other students has been less in this space than in traditional tutorial rooms, offset by their increased use of ICT and Internet-based activities.

From an observer’s perspective, in each of the classes visited students seem to move effortlessly from a computer-based activity to a discussion group, and back again to the online environment. Their social networking skills appear to have equipped them with the ability to quickly decide whose turn it is to summarise notes on the computer, or search for information on the Internet and make PowerPoint™ summaries for use by the whole class. The flexibility of the furniture in the room supports small group discussions and students’ moving in and out of different activities quickly. This is a particular strength of the design of the space. The final report on the pilot of this room will be disseminated in December 2008. Its findings will inform targeted professional development for academic staff planning to use this space in 2009, and the design of similar spaces to be developed in the University in the future.
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References

Concluding Remarks
While many new learning or educational facilities start out with sound pedagogical intent, the resultant design often reflects the imperatives of technology, architecture, or operational considerations. There is however, growing interest amongst higher education institutions in the creation of new types of learning environments supporting learner-centred or constructivist pedagogy. The Pedagogy-Space-Technology (PST) framework developed through the Next Generation Learning Spaces project provides a more systemic way to maintain the appropriate balance between pedagogy, space and technology as a basis for the design and evaluation of new learning spaces.

The PST framework has proven to be a simple yet flexible instrument that assists stakeholders to reflect on ideas and outcomes at every stage in the life-cycle of a new learning space. As a design enabler, it moves beyond general lists of design attributes and provides a structure for design conversations. As an evaluation tool it links intent with outcomes and challenges all concerned to question the ‘what, why and how’ of initiatives to create new learning spaces. Its simplicity means it can potentially be used for any type of learning space, from a laboratory to a learning commons to more conventional performance space.

The case studies presented in this publication illustrate the importance of the PST framework in the design, operation and evaluation of new learning spaces in higher education institutions. The sharing of successful new approaches is leading these institutions to adopt more rigorous testing and evaluation of learning spaces. This will lead to improved learning outcomes and a positive learning experience for teaching staff and students alike.

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