Briefing Paper

The Advanced Concept Teaching Space (ACTS)
October 2008

General Purpose North 4 Building
St Lucia Campus
The Advanced Concept Teaching Space (ACTS) was conceived as a concept and technology demonstration space that would establish the University of Queensland at the forefront of research into Teaching and Learning infrastructure.

Located in the new General Purpose North 4 building on Campbell Drive, ACTS opened in Semester 2, 2008.

With 100 seats, ACTS has the look and feel of a modern lecture theatre but it also hosts futuristic IT and AV systems designed to maximise communication and interaction allowing new concepts in pedagogy and technology to be implemented, tested and evaluated with large student groups. This new facility boasts teaching technology not expected to be commonplace elsewhere for at least a decade.

ACTS, which has been funded from the Australian Commonwealth Government’s Learning and Performance Fund, has a major role to play in meeting the goals of the University of Queensland’s Teaching and Learning Enhancement plan.

A key objective of this plan is to:

*Enrich all aspects of the teaching and learning environment [and] continue to place a high priority on teaching space upgrades and the development of state-of-the-art teaching and learning spaces.*
While ACTS is in itself a state of the art teaching and learning space, the lessons learned from its ongoing operation and evaluation will inform and direct the University’s own practice when building and refurbishing teaching and learning space. It is also expected that ACTS will play a key role in enabling research into new pedagogies, new teaching technologies and teaching space design.

The concept of ACTS was devised by UQ manager of Teaching Technology Support Derek Powell and developed following a series of interviews with leading UQ academics before being presented to Professor Michael Keniger, Deputy Vice-Chancellor (Academic). The approval for the project followed the success of the University’s ground breaking Collaborative Teaching and Learning Centre (CTLC) which opened in the Sir James Foots Building in 2005, although ACTS has quite different goals.

Where the CTLC gives students and academics innovative space and flexible technology to pursue collaboration in teaching and learning, ACTS is squarely aimed at advancing the pedagogy of one-to-many teaching; lectures and seminars.

ACTS uses new technology to maximise the opportunities for interaction between teacher and students; amongst students and between students and the learning materials. A primary goal is to find ways to open new communication channels during teaching sessions. Crucially, this includes being open to integrating ‘student-supplied’ technology. Increasingly, students are using a variety of technology in their lifestyles and learning, and ACTS explores ways to integrate this using wired and wireless networking and direct USB connection.

The goals of ACTS are:-

- Identify the best emerging technology and test it in real teaching situations
- Use the lessons learned to improve future lecture theatre design and optimise the use of technology in these spaces
- Create opportunities for research into tertiary teaching
- Use the lessons learned to inform and direct the University’s own teaching practices
- Provide the possibility of developing intellectual property in the systems and technology implemented in ACTS

ACTS will be a laboratory for teaching technology and is capable of rigorously evaluating each new practice. It will allow the best emerging technology to be tested and adopted into mainstream UQ teaching spaces far sooner than otherwise possible.
While the University has rightly attracted plaudits for its pioneering work in creating spaces tailored for teaching using collaborative modes, it has been recognised that teacher led instruction (such as the lecture format) remains a crucial and much-used pedagogy. ACTS proposes to explore what can be done using technology to develop teacher-led instructional approaches within a university setting.

At the beginning of the design process, the chairs of the UQ Faculty Teaching and Learning Committees were surveyed to determine the kinds of facilities and technologies that academics were most interested in for teaching. The process involved gauging the utility of current technology as well as soliciting reactions to a list of evident future trends in teaching technology.

The academics were also asked about the amount of time which they consider reasonable for the preparation of teaching aids and materials (such as PowerPoint slides, polls and other in-class material) and the utility of real-time feedback from students in class. At each stage, additional comments were sought and open-ended questions probed for new ideas.

The pedagogical ideas and reactions to trends which emerged were used to inform the design and provide an initial roster of technology features. The suggestions were evaluated in terms of improving or opening new channels of communication and these were organised using constructivist principles. Three kinds of interaction are important in this regard: between students and other students; between student and teacher; and between students and the learning materials.

As a result, the features and technologies in ACTS aim to open new channels of communication and to permit new kinds of interactions to occur during class sessions. Some aim at making it practical for teachers to gain extra feedback from students, some allow for student to student interaction during class and some new ideas are aimed at providing new ways for students to interact with the learning materials.

**Teacher-Student Interaction**

Clearly, there is still a role in teacher to student interactions for the use of a projection screen and consideration was made in the space design for this to be a prime element but attention was also given to ways of enabling a “back channel” from students to teacher. Activities in this axis included instant polling which enables students to instantaneously vote on questions, encouraging involvement and also providing teachers with immediate feedback on student understanding of key concepts. Other techniques identified as worthy of trial included anonymous interaction in the form of submitting questions via instant messaging...
which may allow teachers to better manage queries without interrupting the delivery of material.

**Student-Student Interaction**

Academics consistently identified a need to allow students to break into small groups for short periods to discuss matters raised in the presentation and to become active in their participation. With this in mind, attention turned to how the traditional (and space effective) tiered seating could be adapted to allow ad-hoc small groups to form.

**Student interaction with Learning Materials**

Consideration of this axis led to a number of possibilities for improvement. Students should ideally be able to record and annotate on the materials being presented and perhaps be able to access different “layers” of content which has been prepared in advance. It seemed likely that if students were given individual displays, then facilities like translation and access for visually and hearing impaired students may also become more accessible and effective.
ACTS is situated on Level 1 of the General Purpose North 4 (GPN4) building designed by Richard Kirk Architect and ML Design (in association). The building was completed in July 2008 with fit-out of the AV and IT continuing to October.

The space contains several novel elements in its specification. Before construction, and after extensive consideration of the kind of activities required, the general arrangement of the space was documented by Hamilton Wilson (of Wilson Architects). This generic plan became the basis for the detailed design work carried out by Richard Kirk Architects.

Richard Kirk comments:

*In planning the spatial aspects we first considered the pedagogy, which was determined to be primarily a Lecture profile, with the didactic mode taking up 80% of the time. The Cohort in this mode was to be 100 students. The remaining 20% of time was considered to be available for small group discussion with a cohort of four.*

*In response, the design specified a tiered theatre but with a double row of desks per tier and swivel chairs on castors. This would allow collaboration between groups of four with two in each row of the double tier. To accommodate this, the rear desk was made wider and the desktop tablet displays were mounted on swivels. In addition, care was taken to provide an adequate circulation zone.*
The Teaching Stage

The teaching stage was laid out to be as flexible as possible with two “lecterns” (one either side) and three screens for displaying content to the class. Two of the screens retract to reveal plasma displays which function as electronic whiteboards.

Care was taken to provide monitors at the front of the stage so that the instructor could view material on all three screens without needing to turn their back on the audience.

Observation rooms

Since research into teaching methods and technology was a prime function of the space, a spacious observation room was provided at the rear. The wide windows and access to video cameras allows researchers to carefully monitor how students use the various technologies provided. In addition, the room has a duplicate computer and control system to allow an operator to assist the academic in complex presentations.
Although the $1500\text{m}^2$ ACTS has the look and feel of a traditional lecture theatre, it hosts futuristic systems designed to maximise communication. This includes a number of specific directions for researching new ideas and infrastructure in the lecture setting.

**AV in ACTS**

*Advanced Control Systems*

The emphasis of the automated control system is its ease of use and a design philosophy that places the needs of the teachers first. A primary goal is to have all of the hardware and software systems controlled from a single AMX touch screen interface. Touch screen buttons will not only control hardware like switchers but will also “reach through” the computer operating system to launch specific features within a software program on the attached PCs. A single button press will be enough to launch an instant poll on the student touch screens, or to launch translation software that will render a PowerPoint file in six different languages. When the PC is displayed on screen, the touch screen can function like a mouse so that individual browser links, when displayed on the monitor, can be launched by pressing with a finger.

In a first for this kind of technology, AMX Anterus RFID identification tags are used to set preferences in the control system so lecture setup can be automated. Instead of a log-in password, academics may carry an RFID badge so that as soon as they enter the space, the control system will recognise them. The AMX
controller will be programmed to ‘learn’ the individual preferences of each identified user and quickly set up the room to reflect their needs.

**IT in ACTS**
A major technology innovation has been to place a tablet style PC interface at each seat. This has been achieved using a pen driven tablet which communicates via a networked thin client to a rack mounted array of over a hundred HP blade PCs. The PC technology in ACTS is based on Hewlett Packard’s Consolidated Client Infrastructure, a technology that combines server style reliability with high level desktop performance through the use of HP Remote Graphics software. As there are moving parts in the Thin Client devices, this also creates a silent environment for teaching.

The detailed IT design brief was implemented by Luke Angel, Principal IT Officer of UQ Campus Technology Support, with the assistance of Hewlett Packard’s Remote Client Solutions team. Like AMX, HP has been a partner in the project since 2006 providing both consultation and input at the overall strategic level and in-depth technical assistance.

The student interface which combines a HP Thin Client with a Wacom 15” tablet gives the user uniquely flexible control over the educational software environment. The student touch screen functions both as a display and as a control/response system allowing a host of innovative services, which can be tailored to each teaching requirement:
- Look ahead and review
- Polling and voting responder
- Enable anonymous questions
- Download to disc
- eLearning system integration
- Automated language translation of PowerPoint slides
- Information capture for research

ACTS systems allow students to self-guide through lecture material and to review and preview content, or branch off into specially prepared supplementary material. Students are provided with language support in the ACTS through an automated translation system that allows students to instantly search for unfamiliar terms.

**Integration of Portable devices**
A primary goal of the experimental systems in ACTS is to allow students to use whatever technology they prefer in their learning – from iPods to PDA’s, mobile phones to laptops. An important part of the project will be to research and test a variety of ways in which students can use these portable devices to participate in class activities.
• Assignment work, brought to class can be uploaded so it may be displayed via the projectors for class comment and discussion
• Portable devices, connected via the network or USB can be used by the students to participate in polling, or to share applications
• Using various software options, recordings of lectures may be made available to students, complete with graphics. By capturing content from electronic whiteboards and graphics tablets ‘worked examples’ (including handwritten formulae) can be recorded as they happen to allow student review at a later date
• Other content such as readings, references and more can also be downloaded, saving time and resources and enriching the learning experience

Innovative Lighting Design

Lighting is used not only to direct attention and enable note taking, but as a deliberate artistic design element to inspire and motivate. The award winning lighting design by Jared Lilywhite of Connell Wagner is flexible enough to cater for a wide range of applications in the space from lectures to conference sessions to d-Cinema film exhibition and beyond. Accent lighting highlights architectural features to produce a series of very distinctive looks which can be varied according to the time of day and the nature of the functions in the space at that time.

Enabling Research

Integral to the space is an observation room which also functions as a third control point. An identical 24” touch screen allows a technical aide to assist with smooth operation of the systems and provides full preview and monitoring from the same screen. Additional thin client facilities are networked into the student PC systems for researchers to observe and gather data regarding patterns of interaction and educational outcomes.

Keeping the Space Current

An issue with any new space, especially one that contains leading edge technology, is that it can date very quickly. Thus the design and installation of ACTS anticipated the likelihood of advances in technology over the lifetime of the space. The innovative Hewlett Packard “blade” PC system allows the student computers to be replaced and updated as technology advances by simply sliding out a PC card and replacing it with a new model. AMX technology, which allows program changes to enable users to take complete control of any new hardware or software, will be similarly crucial in this respect.

Importantly, teachers will not have to embark on a massive learning curve to use the new facility. Using the simplified AMX interface, teachers can choose which technologies to trial and do not have to come to terms with all of the new ideas at once.
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