

# 5.16

## 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

### 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.

PETER TREGLOAN

UNIVERSITY OF MELBOURNE, AUSTRALIA



The Learning Lab was the first stage in a major redesign and building program at the University of Melbourne, where new teaching laboratories, informal learning spaces, major lecture theatres, student support and advice services, library and computing/ICT access, will all form part of a chemistry learning precinct.

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.





### 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.

Group work and moderated peer explanation is a feature of the approach; the objective is to build students' confidence to 'talk chemistry' in describing what they are seeing and learning. The response of staff and students to this has been very positive. The flexibility of the physical facilities in the space and the variation in the design of student tasks to accommodate the strengths and experience of the staff and students are central elements in the program.

### 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

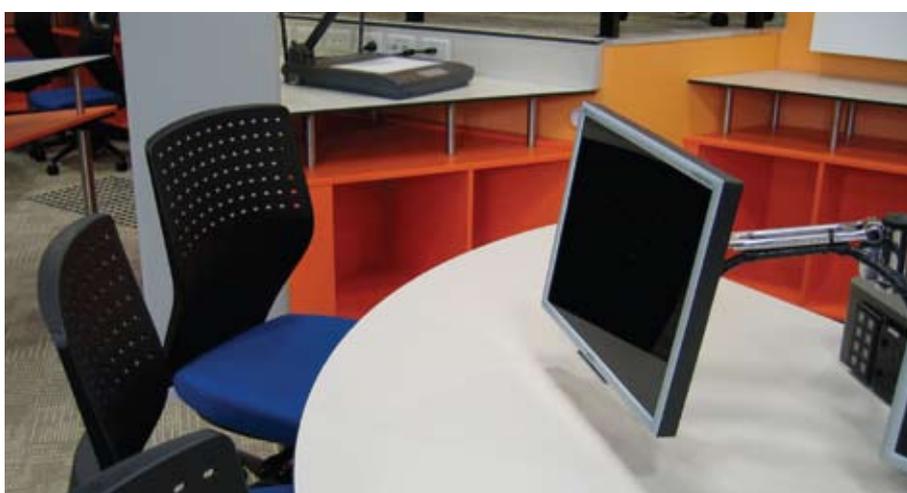
expectation and experience. In these situations, control of the zone LCD displays can be handed over to the student groups to use their own computer, document camera or other sources to share information within their group. Later these sources can be switched back to central control to share with the 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.

### **Acknowledgements**

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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.