

Karen Scott and Mary Peat

Faculty Online Learning Team

Supporting elearning: philosophy, projects and product

The University of Sydney set up an elearning support initiative in 2004 to enhance student learning and provide sustainable learning technologies which would promote research-led, active, innovative approaches to learning and teaching. One of the key strategies is to support academic staff through the development of elearning projects. The University's faculties work within the University guidelines for the development of elearning projects, and have been grouped into three clusters to work out the best mix of projects. The central initiative has provided each cluster with an annual allocation of 4000 hours of support for strategic projects which are operationalised by educational design and project management staff from the centrally-funded group, USyd eLearning. This poster addresses what types of projects have been supported in the Sciences and Technology cluster over the past two years, and whether we can already point to significant output that is enhancing the learning experience of students.

H.G.E. Lloyd and T. Hinton

School of Medical Sciences (Pharmacology)

Effectiveness of problem-based learning tutorials on student learning and course experience in basic pharmacology

The use of problem-based learning (PBL) as a teaching method is well established in medical education (Wolfram and Stefan, 1999). In Pharmacology, from 2002 - 2004, we ran two parallel courses, one of which included PBL tutorials. The present study was undertaken to determine whether running PBL tutorials within a traditional lecture-based course: (1) improves learning outcome and (2) affects students course experience. Learning outcome was assessed by comparing student examination performance at the end of semester. The examination included 60 multiple choice questions (MCQ) and four short answer questions (SAQ). A validated course experience questionnaire was used to determine students' course experience. Comparison of the results for PCOL2002 (n = 67) and PCOL2003 (n = 114) showed no difference between scores for either the MCQ or SAQ sections, however, there was a tendency for PBL students to perform better in the SAQ section. This difference in performance was more prevalent in students who were performing poorly (mark of less than 50%) with 11% falling in this category for PCOL2003 and 24% in PCOL2002. Analysis of questionnaires showed no difference in course satisfaction between PCOL2002 (n = 17) and PCOL2003 (n = 33), with the overall satisfaction on a 5 point scale being 3.94 (PCOL2002) and 3.88 (PCOL2003). In conclusion, this study indicates that PBL tutorials improved performance in students who are "at risk". Course satisfaction was relatively high for each group.

Wolfram, A. and Stefan, H. (1999) Problem-based learning versus lecture-based learning in a course of basic pharmacology: a controlled, randomized study. *Med. Educ.* **33**, 106 – 113.

Tara Murphy and James Curran

Faculty of Science

Research-led teaching in INFO1903

In 2006, we developed and ran a new first year course, INFO1903 Foundations of Information Technology (Adv). One of the aims of this course was to teach advanced science students the IT skills they will need in research. Research-led teaching was a critical component of the course.

We will outline our use of research-led teaching in INF01903, which includes:

- tutorial and assignment questions use real research data;
- the main project based on a system to aid linguistics research
- research skills are developed through
 - * writing a scientific report
 - * giving a presentation suitable for a scientific conference
 - * spending 15 minutes of each lecture doing Back of the Envelope exercises
- two lectures with mini research seminars by academics in the school of IT;
- every topic in the course is linked to an active research area.

We will also discuss feedback from the first group of students to do the course and plans for further development of the course.

Peter A Windsor

Faculty of Veterinary Science

Integration of research led teaching in ruminant veterinary medicine and rural public practice for improved knowledge of veterinary public health

Recent research conducted on initial career experiences of Australian veterinary graduates has shown a significant trend away from serving the rural industries and working in veterinary public health agencies (1), leading to concerns over our national animal disease surveillance and emergency response capacity (2). To help address the current difficulty in the recruitment of rural veterinarians and those interested in veterinary public health careers, changes to the undergraduate curriculum BVSc at the UoS include:

- a student-focused T&L philosophy to encourage deeper learning through innovative teaching practice including research led teaching
- development of a semester 8 unit “Ruminant Health and Production” (RHP; 10 credit points) with provision of Web CT delivered on-line case-based resources known as “TILHAP’s” (teaching innovations in livestock health and production), linking clinical research problem-solving to industry web resources and an enhanced faculty image database “OLIVER” (on-line library of images for veterinary education and research containing over 10,000 images and videos of animals and disease), requiring group case study presentations and written reporting
- development of a semester 9 or 10 extramural unit “Rural Public Practice” (RPP; 5 credit points) located with an agency delivering public health outcomes, requiring on-line delivery of a publication standard research or extension project report, a web-based component of reflective journal discussion for documentation of ‘intern’ experience, a communication task and successful assessment of professional competencies by an external supervisor completing a “supervisor report form” (SRF).

Analysis of 3 years of student cohorts in RHP followed by RPP (via exit surveys, SRFs and reflective journals), it is apparent that there is successful integration of the two units. The skills developed by the research led teaching resources (e.g TILHAPs) have resulted in intern UoS satisfaction rates exceeding 90%. Most pleasing is the high level appreciation by professional affiliates of the communication and research competencies of our interns just prior to their graduation and the strengthening of UoS linkages to the rural industries.

References

1. Heath T. (2004) Recent veterinary graduates. *Aust Vet J*; 82:602-604
2. Frawley PT. (2002) Review of Rural Veterinary Services, AFFA.
http://www.affa.gov.au/corporate_docs/publications/pdf/animalplanthealth/chief_vet/vetreport.pdf

Inakwu O. A. Odeh

Faculty of Agriculture, Food & Natural Resources

Research-led teaching in undergraduate Geographic Information Systems unit of study: tilting the balance in favour of student-centred approach

A Rural Spatial Information Systems (RSIS) unit of study (UoS) was recently introduced by the Faculty of Agriculture, Food and Natural Resources. The UoS is designed to highlight the various sources of geospatial information and data, and to impart knowledge and skills in spatial analysis and geographical information science (GISc) for decision-making based on environmental modelling and natural resource-management in a rural context. RSIS is built on spatial information systems, a generic term used for geographic information systems (GIS). Traditionally teaching of GIS courses is based on practical and enquiry-based tasks which can be viewed as teacher-focused. However, recent developments in the field of pedagogy have brought up a different student-centred perspective generally viewed as positive. This paper explores the route RSIS has taken within the last couple of years in which teaching instructions have been created to emphasise student participation in research-related tasks as part of their learning process. We examine the different learning tasks based on enquiry-based and problem-solving practical exercises which are intended to teach students research methodologies, methods and the types of quantitative analysis used for land resource assessment. We provide some observations as to how students may perceive and benefit from this change in focus in the UoS.

Dhia Al Bakri

Faculty of Agriculture, Food & Natural Resources

Research Led Teaching in Limnology and Water Quality: Bachelor of Land & Water Science (BLWSc)

Limnology (study of physical, chemical and biological aspects of inland waters) and water quality are taught within the third year unit of study LWSC3004 and the fourth year unit LWSC4003 of the Bachelor of Land and Water Science. Learning in both units of study is facilitated by adopting a research-lead teaching approach. Small-group research projects were conducted by the students over several weeks of their practical classes in the South Creek Catchment. The South Creek, a tributary of the Nepean-Hawkesbury River, is one of the most stressed water courses in the Sydney Basin. Third year students carry out field and laboratory - based research to identify pollution sources and develop sustainable management strategies to combat eutrophication (nutrient enrichment) and algal blooms in the surface water of the catchment. In their fourth year unit, students investigate the hydro-geochemical processes and their impact on groundwater quality and salinity and evaluate the effectiveness of the recently developed pollutant trading scheme in the South Creek Catchment. The research outcomes are communicated as oral presentations and written reports. An integral part of the research activity, the learners are encouraged to discuss and critique their research findings and recommendations to enhance their learning experience. The students also participate in assessing the oral presentations of their colleagues.

Students' feedback received through the confidential unit of study evaluation (USE) for both subjects has demonstrated high satisfaction level with this teaching and learning strategy. From educator's perspective, research-led teaching is a powerful strategy to stimulate students' curiosity, enhance their motivation to learn, foster deep learning and facilitate their development as professionals and scholars.

Jaime Gongora

Faculty of Veterinary Science

The research proposal: a tool for assessment and approaching research situations

A graduate attribute for the BAnVetBiosc program of the Faculty of Veterinary Science focuses on how students can 'engage in research in a scientifically rigorous manner with regard to experimental design, technical limitations and statistical analysis of results to further expand the body of knowledge in their field of interest'

In order to develop this graduate attribute, second year students have been asked to submit a 'Research Proposal' for the Animal Conservation Biology course. The learning outcome of this activity is that students are able to discuss possible research approaches to address a specific problem in conservation genetics. Students need to formulate aims, describe the relevant background, propose a scientific methodology and discuss the impact of the expected outcomes. The significance of this approach is that it develops a students ability to: approach and work through a research problem; engage more fully in the literature than traditional methods of assessment would allow; and understand how undertaking research allows a body of knowledge to be expanded.

H. Forsyth¹, C. Moran¹, J. Gongora¹, R. Laxton² and J.H.J. van der Werf³¹Faculty of Veterinary Science, ²Educational Designer, R. L. Learning Designs, Sydney, ³School of Rural Science & Agriculture, University of New England*Developing postgraduate coursework as action research*

We will report on the design, and progress in phase 1, of an action research project attached to the development of a new, online postgraduate program in Animal Breeding Management as a mechanism for the evaluation of new educational initiatives.

In order to incorporate critical reflection into our development, the project plan includes:

- Advice from end-users in the planning phase
- Designing the program on the basis of experience, scholarship and research in online distance education
- Feedback at regular intervals from industry and academics
- Formal processes for all participants in the project to reflect and provide feedback
- The modification of course components and practices as necessary on the basis of this feedback
- Ongoing advice from industry organisations, employers and other end-users during course delivery
- Modifications on the basis of reflection on practice and other sources of feedback

Through action research, the project can attain quality outcomes and new practical and conceptual knowledge can be formed about professional education in animal breeding, which can then be used as a resource by educators in similar educational settings. (see Zuber-Skeritt 1992).

Paul Sheehy, Imke Tammen, Rosanne Taylor

Faculty of Veterinary Science

Learning through Inquiry in Cellular Biology

The Cell Biology 1B unit of study is taught in Year 1, Semester 2 of the BVSc degree program. The syllabus focuses on the molecular biology of animal cells and includes clinical examples and applications. The conceptions of basic molecular function of cells are built up from simple basic genetic mechanisms, through to application of molecular and cellular biology in clinical contexts like recombinant DNA technology, DNA diagnostics and gene therapy. There are a number of summative assessment activities including an end of semester examination (65%) and a group learning task involving student presentations (10%). The other 25% of summative assessment is comprised of an individual inquiry task which requires students to 'Outline an innovative molecular or cell based approach to the treatment or therapy for a series of selected disorders, animal production constraints or biomedical applications'. The exercise is designed to draw on the students' fundamental understanding of cellular biology and to apply it in a creative way to formulate a theoretical approach rather than reporting or reviewing existing approaches. The topics have included any known inherited disorder in animals, enhancing resistance to avian influenza and other viral diseases, xenotransplantation, enhanced persistence of lactation in dairy cattle and treatment of specific types of cancer. The task is supported by an initial posting of topics and suggested approach to a *WebCT* discussion board to allow allocation to an inquiry task support session in which students outline the topic and theoretical approach to treatment or therapy and receive immediate feedback from staff and peers. There is also an outline of expected format (1000 words), issues to be covered and assessment criteria. An example of a more creative assignment is also posted on *WebCT* to further indicate the level of detail required and issues that should be considered.

Student feedback has indicated that while they consider the workload to be significant they enjoy the challenge and the opportunity to be independent, creative and able to pursue a personal interest.

Rosanne M. Taylor¹ and Paul C. Mills²¹Faculty of Veterinary Science, ²School of Veterinary Science, University of Queensland*Learning through benchmarking*

Collaborative benchmarking has been proposed as a valuable tool to support evaluation, reflection and efforts to improve curriculum and students' experience of learning in higher education (Schofield 1998). Where the benchmarking process focuses on aspects of teaching and learning that are influential in creating a quality learning experience for students it can have a powerful, transforming effect in motivating staff to pursue continuous improvement. This approach helps to embed and sustain a quality enhancement culture if it is extended beyond individuals to involve a wider school or faculty group (Biggs, 2003). One such approach is explored in this study where we sought to benchmark the teaching context and curriculum, with a focus on use of learning and assessment activities that sequentially develop graduate attributes in early units of a professional course at two universities. We report a model which was developed for comparing a cross-sectional slice of teaching and learning in two similar units, courses and faculties. An aligned teaching and assessment activity designed to develop graduate attributes in professional communication and team work was trialed in two units with the intention of identifying strategies that were most effective in stimulating deep learning and establishing teaching 'best practice'. The context for teaching and learning in each unit influenced the effectiveness of the task in promoting student engagement. The model which was developed in this investigation forms a useful, practical starting point for planning collegiate benchmarking designed to stimulate rich discussion and to motivate scholarly teaching practice to enhance student learning.

References:

Biggs, J. B. (2003). *Teaching for Quality Learning at University: what the student does* (2nd ed.). Philadelphia: Open University Press.

Schofield, A. (1998). *Benchmarking in Higher Education: An International Review*. London, Paris: CHEMS, UNESCO.

Rosanne Taylor

Faculty of Veterinary Science

Assessing to encourage integration across disciplines- does it enhance learning early in a professional degree?

Students experience of learning can become fragmented in a course composed of eight or more units in a year each composed of further topics. Learning research shows that a cohesive, holistic framework for understanding and making meaning of new topics is essential if students are to achieve higher quality, lasting learning

outcomes. One way to help guide students away from seeing their learning as a jumble of competing bite sized pieces of information to be retained and reproduced is to use learning activities and assessments that require and reward integration and application across curriculum boundaries. This study reports an investigation of the design, implementation and outcomes of a series of integrated assessments for year 1 and 2 veterinary science students. These were challenging for staff to design and coordinate, but proved worthwhile as they stimulated students to take deep approaches and strive for cross disciplinary learning through problem solving tasks. While the mechanics of administering these tasks have changed, the principles gained acceptance with staff, and have led to earlier, more effective ways of assessing the development of a range of graduate attributes demonstrated within a disciplinary context.

Bill Pritchard

School of Geosciences

A research-led teaching model for GIS in Economic Geography: Using the Census to Map Employment Patterns in Sydney

Integrating GIS within undergraduate Geography programs represents a major pedagogic challenge. All-too-often, GIS is taught as a set of technical skills in stand-alone computer lab classes, detached from the theories, ideas and debates introduced in lectures. This paper describes an approach introduced in 2006 with the purpose of integrating lecture-based materials with computer lab work. The central focus for the approach is an on-going research project by the lecturer that seeks to critique theories of industry clustering in the IT sector on the basis of census employment data in Sydney. Using one of the lecturer's published articles, students are required to firstly read and review the theoretical arguments underpinning the lecturer's research and then, secondly, use GIS techniques to corroborate the article's findings. Through these means, students are provided with a practical and hands-on demonstration of the ways in which academic researchers develop conceptual arguments through the use of evidence. As such, the teaching of the technical skills associated with GIS becomes a strategy for a wider intellectual project of encouraging students to understand research processes, as opposed to being a stand-alone activity in its own right.

Charlotte Taylor¹ and Brett Green²

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The Sydney Basin Aerobiology Survey: incorporating students into a current research program as part of the first year Biology curriculum

Introducing undergraduates to the research culture in science, and in a research intensive university, can be particularly daunting for teachers in large first year courses. While discussions and case studies in lectures or tutorials are frequently used to highlight current research projects and findings in the discipline, it is more difficult to get students involved in hands on research in laboratory programs.

Our initiative has integrated a research component into a first year biology course by using an existing lab exercise as part of the data collection process for research being carried out in the Faculty of Medicine at the University of Sydney. In doing this we have capitalized on the component of the course which is usually a major stumbling block to running authentic lab activities, namely the size of the student cohort (Brew 2001, in press). The semester 1 first year course has 1000 students, who provide an ideal research team for carrying out a survey of airborne fungal spores in the Sydney Basin. Such an extensive survey has proved impossible as part of the existing research project (Green et al 2006) because of the expense and time constraints in surveying such a large area.

Our initiative transformed a classic laboratory exercise, teaching students about sterile techniques in microbiology, microscopy and use of keys for fungal identification, into part of an existing research project determining presence of potentially allergenic fungal spores in the air. Each student collected samples from their home suburbs in Sydney and surrounding areas and identified the colonies growing on their plates. The resulting data set (1000 samples) was then analysed using GIS to map distributions of fungal genera across the Sydney Basin, and students wrote a short report on the findings. A lecture on the research project, and the students' part in it, introduced the group to the literature on links between fungal spore distribution and public health problems such as allergic reactions and asthma, and pointed out the lack of large scale surveys of fungal spores. Their contribution to the field was thus highlighted. Evaluations of the initiative indicated that students in this course had a increased appreciation of the culture of research and being part of a research community (as measured by SCEQ and USE questions), as compared to a control group who carried out a traditional lab exercise with no novel investigative component.

The limitations of carrying out such an investigation with novice scientists, is discussed by students in their report and by teachers in terms of these data adding to knowledge in the field. As part of the evaluation we therefore double checked the students' ability to correctly identify the fungi, thus providing a check of reliability of the data set for the project team, and providing an insight into the success of the lab learning environment for the teachers.

References

- Brew, A. (2001) *The Nature of Research: Inquiry in academic contexts*. London: RoutledgeFalmer.
Green, B.J., Tovey, E.R., Sercombe, J.K., Blachere, F.M., Beezhold, D.H. and Schmechel, D. (2006) Airborne fungal fragments and allergenicity. *Medical Mycology*, **44**, S245-S255.

Imke Tammen, Rosanne Taylor and Paul Sheehy

Faculty of Veterinary Science

Research led learning and teaching in Cell Biology - a first year unit of study in Veterinary Science

Over the past three years we have implemented on-line and group learning activities in Cell Biology 1A and 1B, two first year units of study in the BVSS degree in the Faculty of Veterinary Science. The new learning activities provide a more interactive approach engaging the large classes (130 students) in learning and are designed to integrate the units' learning and teaching activities with development of graduate attributes in research and inquiry, professional communication and team work.

In Cell Biology 1A face-to-face learning activities are enriched with four compulsory on-line interactive modules, which focus on the preparation for practical classes. Students engage in interactive individual activities, structured group discussions & learning activities, and formative and summative assessment tasks. Time during lectures and tutorials is used to introduce students to *WebCT* and to discuss the aim and the outcomes of the activities.

In Cell Biology 1B a group learning activity was designed to support students learning about DNA. Students developed practical skills through a problem solving practical class in DNA diagnostics, they also worked in teams to critique and present current DNA diagnostic research papers in a veterinary context. Students developed skills in professional autonomy through peer feedback and assessment of the group presentations in class.

These structured group learning activities are not only addressing a range of graduate attributes but also assist in the year 1 transition phase by stimulating the development of a learning community.

Felicity Muller and Dr Stephen Cattle

Faculty of Agriculture, Food and Natural Resources

What is WebCT? Building and engendering support for WebCT and e-learning in FAFNR

Limited utilisation of *WebCT* by the Faculty of Agriculture, Food and Natural Resources was viewed as a major problem by the Learning and Teaching Committee of 2005. In response, a TIF application was submitted and successfully awarded to the faculty, enabling the expansion of online learning. As a result, the teaching environment FAFNR has undergone major changes, with most (approximately 45) units of study in Years 1-4 now utilising *WebCT* sites.

In addition to a simple adoption of *WebCT*, the faculty has also undertaken several initiatives, including the introduction of degree sites, implementation of Case Builder and incorporation of research-led teaching materials. Each program aims to enhance students learning and extracurricular experience during their time at university, allowing students' to widen their understanding of 'classroom' concepts and gain valuable work and life experience.

OTHER POSTERS

The Talented Student Program in the Faculty of Science

Examples of research project posters created by first year science students.