



The Teaching-Research Nexus

A guide for academics and policy-makers
in higher education

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Examples from Australian universities

Modelling, Implementing and Evaluating Research-Related Learning, Teaching and Assessment in *Human Biology*, a Large First-Year Class

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Broad discipline area:

Natural and Physical Sciences

- Biomedical Sciences

Year level:

- First year undergraduate

TRN strategy:

- Placing the latest research in the field within its historical context in classroom teaching
- Designing learning activities around contemporary research issues
- Teaching research methods, techniques and skills explicitly within subjects
- Encouraging students to feel part of the research culture of disciplines
- Infusing teaching with the values of researchers
- Conducting and drawing on research into student learning to make evidence based decisions about teaching

Teaching and learning contexts:

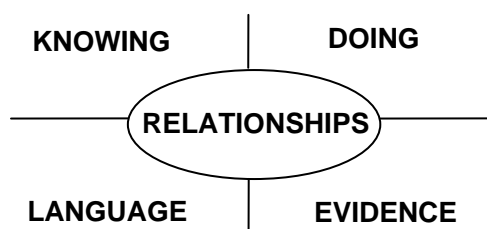
- Large group lectures
- Small group classes/tutorials
- Lectorials (large group tutorials)
- Online/blended learning
- Practical experiments
- Group-based assessment (including applied assignments and community-based projects)
- Curriculum design
- Course evaluation
- Reflective learning

Brief description of the initiative:

Engaging large classes of first-year students in the research culture is a major goal of the School of Biomedical Sciences (SBMS) at The University of Queensland. These academics briefly document how teaching and biomedical research were more effectively integrated in *Human Biology* (BIOL1015) from 2005 to 2008. Since then, these changes have been sustained in *Cells to Organisms*, a foundation course in the new Bachelor of Science degree program which commenced in 2008.

BIOL1015 was offered in both semesters for over 1300 students per year from Pharmacy, Human Movement Studies, Dentistry Science, with smaller numbers of students from Engineering and dual degree Medicine and Science. Prior to 2005, large classes were delivered as traditional lectures and practicals and some supplemental learning. Assessment consisted of 80% multiple choice examinations with questions predominantly requiring low order thinking, and 20% quizzes on practical components. The modes of delivery and assessment did not support engagement or critical thinking required of research-related learning.

In 2005, Moni & Moni¹ formed the Educational Research Unit within the SBMS. They framed the course renewal around Moni et al.'s model² of research-related learning and teaching to reflect the research-intensive nature of the university culture and contexts. This pedagogical model describes for students and staff, essential elements of learning about science in schools to professional practices in the Biosciences – knowing (facts, concepts, procedures), doing (skills, practices), evidence (inquiry learning), language (socialization and identity) and relationships (interactions with peer and mentors).



A model of research-related learning showing the framework supporting the renewal of BIOL1015. All assessable course domains are underpinned by learning relationships.

Aligned to this model, this group of academics designed, implemented and evaluated three innovative summative assessment tasks each supporting different aspects of development of research-related learning – the Personal Response³ (engagement and reflective writing), the Biohorizons eConference⁴ (online learning, immersion in research culture, formal academic writing and peer view) and individualised testing of core manipulative skills in laboratories⁵ (confidence and competence). Student learning was supported throughout the semester by their Peer Embedded Group Study (PEGS) program, based around cooperative learning principles and formative assessment. The authors' triangulated evaluations have demonstrated more positive attitudes to the course, enhanced engagement in learning and improved academic outcomes across a balanced assessment program. There has also been a greater focus across all components of the course on professional development of tutor-facilitators. Changes to the delivery mode of the course included consolidation of lecture content, development of lectorials (large group interactive tutorials), use of KeePad technology for ongoing formative assessment and integration of practicals with the lecture content and PEGS to support the course assessment based on co-operative team work in 2006-2007.

To date, these academics have documented the enhancement of BIOL1015 over six semesters for 3,700 students. In semester 2 of 2007, the overall course evaluation was

4.26 (from 5); teaching evaluations for the teaching team were 4.5 and above, and the overall pass rate was 81%. In semester 1, 2008 laboratory classes are being re-designed to more directly support group-based inquiry learning using blended learning.

Selected Publications

1. Moni, R.W. and Moni K.B. (under review). Developing a Model of Research-related Learning and Teaching to Enhance Assessment in Human Biology.
2. Moni, R.W., Poronnik, P., Moni, K.B., Lluka, L.J. and Hryciw, D. (2006). *Framing Research to Enhance the Quality of Teaching and Learning in Science*. TLHE2006: Quality in Higher Education. 6-8 Dec, pp. 76-79. Singapore.
3. Moni, R.W., Moni, K.B., and Lluka, L.J. and Poronnik, P. (2007). The Personal Response: A Novel Writing Assignment to Engage First-year Students in Large Human Biology Classes. *Biochem & Molec Biol Educ*, 35, 89-96.
4. Moni, R.W., Moni, K.B., Poronnik, P. and Lluka, L.J. (2007). Biohorizons: An eConference to Assess Human Biology in Large, First-year Classes. *Biochem & Molec Biol Educ*, 35, 255-265.
5. Moni, R. W., Hryciw, D.H., Poronnik, P., Lluka, L.J. and Moni, K.B. (2007). Assessing core manipulative skills in a large, first-year laboratory. *Advan Physiol Educ*, 31, 266-269.

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SBMS Educational Research Unit website URL:
<http://uq.edu.au/sbms/education-research-unit>