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The undergraduate research apprenticeship – improving the relevance of science teaching through authentic research experience

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The undergraduate experience is arguably the most important in shaping the future career trajectories of students. It is here that early exposure to the widest possible range of disciplines and practical experiences will have the most impact. In the face of a reduction in the number of students entering both undergraduate science and research as a career option, we must urgently initiate strategies to engage and retain students in science. This can be achieved by a research experience in a 'mentored apprenticeship model' in the context of an authentic laboratory/field during their formative undergraduate years.

It is widely acknowledged that an interactive, enquiry-based approach to learning provides the most meaningful and lasting learning experience for students. It is similarly accepted that, within science, undergraduate research experiences are pivotal in providing context to student learning and providing a true sense of what it means to be a 'scientist'.

In this discussion forum we will summarise research-based experiences currently available for Bachelor of Science (BSc) students at The University of Queensland (UQ). We will then look in detail at a proposed new 'mentored apprenticeship model', being examined for introduction into the UQ BSc from 2008 following the recent major review.

The proposed model builds on the existing UQ Advanced Study Program in Science combined with the University of Michigan's Undergraduate Research Opportunity Program and aims to:

- achieve an increased level of student engagement to complement other strategies for motivating students who are in large first year classes
- show students the functional/practical relevance of the core content of their course material

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- provide students with a personal experience of doing science so that they can plan their future studies from a more informed perspective
- minimize the attrition rate from the first year science cohort
- provide a mentored cohort experience to engage and support under-represented groups such as indigenous and international students
- actively build on the tremendous investment in institutes at UQ by increasing the direct involvement of these research academics in the undergraduate science program (for example, places for 25 students have already been committed by one of the UQ research institutes)
- increase the number of students proceeding to postgraduate education as the next step to a worthwhile and personally rewarding career trajectory in science.

The proposed 'mentored apprenticeship model' provides a step-wise approach to a student's growth as an apprentice scientist. As undergraduates progress through their degree-program their learning experiences in science should also progress closer and closer to those of a 'scientist' until, on graduation, they are fully-prepared for their science-related career. The new model achieves this through establishing strong working partnerships between students and research groups, supplementing traditional practical components of undergraduate courses by 'doing' more science and providing students with an opportunity to talk more about science.

Within this forum participants will be asked to explore:

- How are the theoretical frameworks of enquiry-based learning being translated into practical applications?
- What are the outcomes of an undergraduate research opportunity?
- How do we assess this learning?
- What are the experiences of other institutions – how have they met the challenge of an authentic research experience, in a research-intensive university, for large numbers of students?
- Are there discipline-specific variations to these approaches?