

## Science education research

**Ian Johnston** and **Mary Peat**, UniServe Science, The University of Sydney  
idj@physics.usyd.edu.au maryp@bio.usyd.edu.au

### Background to this workshop

In today's universities, the job description of academics includes both research and teaching; and while the ideal is that all should be equally interested in both activities, in reality there is a wide spectrum of commitment to either. On the one hand there are those who prefer to spend all their time in research, in pushing forward the frontiers of knowledge in their subject. By and large our university system is tolerant of such people, drawing comfort from the fact that some of the world's most productive scientists have been indifferent teachers. Examples quoted usually include Kepler and Einstein. On the other hand, there are those who are more interested in teaching, in exploring ways to communicate this knowledge to students. Our university system is less comfortable with such people: there seems to be something of the 'those who can, do: those who can't, teach' attitude. Yet increasingly many academics believe that the process by which our subject is codified and passed on to the next generation is a worthwhile field of research in its own right. In science departments in universities throughout the world there have sprung up, in the last decade or so, groups of academics whose main research interest is in the development and practice of their own teaching.

The interesting development is that many of these groups have adopted the philosophy that this kind of educational research is best done, not within traditional Education Faculties, but within science departments and conducted by experienced scientists. The appropriateness of this philosophy is argued on several grounds. Basically they come down to the contention that university education in general, and university science education in particular, must be considered to have their own unique needs and difficulties. We practising scientists have spent a long time learning our subject. We may or may not have found it difficult; we all found it rewarding. Why then do so many of our students find it hard and dull? We can only answer this by thinking deeply about science and pedagogy at the same time. And the payoff is that, by doing so, we can deepen our own understanding of our subject and possibly come up with new methods of passing it on to those who follow us.

This change in attitude of the relation between teaching and research — is it too much of a cliché to call it a 'sea change'? — seemed to begin in the 1980s, largely in physics and largely in the United States. Since then it has spread to other disciplines and countries. In Australia we can now boast a wide range of such work being done at a significant fraction of our universities — as evidenced by the papers in this proceedings. Therefore we at UniServe Science considered it appropriate that the topic of this, our sixth annual national workshop should be 'Research and Development into University Science Teaching and Learning'.

### What happened at the workshop

The keynote speakers were Professor Dick Gunstone from the Faculty of Education, Monash University, and Dr Marjan Zadnik from the Physics Department, Curtin University of Technology. Professor Gunstone's address was on the theoretical aspects of how the kind of teaching development that good university teachers carry out can be turned into research outcomes. Dr Zadnik's presentation covered the ways in which he has successfully linked his teaching and research.



As it turned out Professor Gunstone was ill on the day and his paper was presented, most ably, by Ms Susan Feteris from the Department of Physics at Monash University.

The contributed papers, as you can read, cover a wide range, both of subject matter and disciplines — the transferability of mathematical skills, the effect of simulations on learning strategies in chemistry, peer group learning in biochemistry, assessment strategies in physics, the use of constructivist methods in geology, the large scale evaluation of educational resources, and exploration of student and staff perceptions and specific teaching strategies in experimental laboratories.

An innovation this year was the introduction of a ‘Show-and-Tell’ poster session. There were 8 posters contributed, too many to find time in a single day’s workshop for each author to give even a short presentation. In an effort to give each presenter the chance to say something publicly about their poster, we adopted the following procedure. An hour was set aside for formal poster viewing. Each author was asked to give a short, 5–10 minute, talk to whomever wanted to hear; and to repeat this every quarter of an hour. This seemed to be well received and we will follow that procedure in future.

### **Pearson Education UniServe Science Teaching Award**

This was the first time this award was made. The idea had been worked out between us and Susannah Bowen of the publishers, Pearson Education Australia. The award was to be made for teaching that improves student learning outcomes via the innovative and integrated use of information technology. There were 13 entries, and the judging panel, Professor Bob Hewitt (chair), Professor Shirley Alexander (UTS), Dr Roy Lundin (QUT) and Mr Shane Donnelly (Pearson Education Australia) had an extremely difficult job in making the final decision.

The winner was Robert Davidson from Charles Sturt University for his project: *MRI Concepts: A CD-ROM based teaching tool*. You can read a full description on page 17 of these proceedings. Our most sincere congratulations, to Robert, and our thanks to all those who sent in entries. We hope we will have as good a field to choose from this year.

### **Other issues**

An important decision we made this year was that the contributed papers could be peer reviewed. While this might detract a little from the open forum nature of these workshops, everyone is all too aware of the need to produce refereed papers to satisfy the funding criteria that our departments struggle under. Hence we made that decision, in the knowledge that it would delay publication of the proceedings quite a lot — as indeed it has. We will review this decision before next year’s workshop.