

## Sustaining teaching development through research: The lead up to a National Teaching Development Grant

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*Abstract: The modification and rejuvenation of existing curricula and teaching styles to include advances in education research can be a daunting process. The School of Physics at The University of Sydney has successfully launched strategies for student oriented learning in large first year classes. One such strategy, the Workshop Tutorials, has been extremely well received. It is based on cooperative grouping and the extensive education research available on students' conceptual understanding in physics. The origin of these Workshop Tutorials is found in specially designed optional remedial-tutorials for students in a large mainstream first year physics class in 1993. Evaluation and analysis of evaluation has provided a method of incorporating research into what is basically a teaching development initiative. The research has in turn sustained and provided data for ongoing support and growth of the teaching development initiative. The Workshop Tutorials provide a rich context to investigate issues in Physics Education Research, resulting in projects being available to students enrolled in Third Year and Honours Physics units. The Workshop Tutorials form the basis of a successful large National Teaching Development Grant involving several Sydney metropolitan universities.*

*In this paper we present the key aspects in the initiation and development of the Workshop Tutorials that led to its success. In particular the pivotal role of research in sustaining teaching development will be discussed.*

### Introduction

Workshop Tutorials are a successful teaching and learning strategy designed to improve student learning. The implementation has been gradual and the learning environment has evolved based on our awareness of educational research data and, in particular, data from researchers in physics education. A conscious effort to maintain a strong research profile within what is basically a teaching development project has led to expansion and growth of the project.

### A research basis for the initial stages of the project

The workshops were designed initially as remedial sessions and were based on cooperative learning where students work in teams of four (Heller and Hollabaugh, 1992; Van Heuvelen, 1991). The workshops were evaluated in 1993, introducing an aspect of research. The evaluation elicited qualitative responses and some typical student comments were:

*more understanding has made me more confident;*

*I am now more able to understand how to solve problems more efficiently; and*

*[tutorials] have increased my interest in physics.*

A simple quantitative analysis showed that 87% of the students who attended more than a third of the tutorials improved their marks, the mean average increase being 13%. The evaluation was very basic but the results showed improved student learning outcomes, providing justification for the existence of the workshops.

### Research and dissemination

Successful grant applications were written for various university and faculty level Teaching Development Grants. The applications were based on our increased awareness of educational



research data and feedback from students and staff. The grants were used to include lecture demonstrations, improve workshop activities, and to expand the workshops into the four mainstream courses. The 1995 student attendance record was carefully maintained and analysed. The evaluations showed that students attending more than half the total number of Workshop Tutorials scored significantly better over the year than those attending less than half. More importantly, in the less tangible affective domain, students' feelings about the learning style used in the Workshop Tutorials had been almost wholly positive. The results supported the claim that students involved in cooperative learning schemes consistently out-perform those in the more traditional teacher-orientated systems (Hake, 1998; Heller et al., 1992; Thornton and Sokoloff, 1998). The workshops were presented at the 1998 Pacific Rim conference (Sharma et al., 1998) and subsequently published in an international refereed journal (Sharma et al., 1999). In addition, research projects within the context of the Workshop Tutorials are available to students in Third Year and Honours and as Vacation Scholarships.

### **Basis for a successful grant application**

In 1999 we put forward an outline of a proposal for an organizational National Teaching Development Grant. The proposal satisfied the selection criteria which required that there be educational research background, knowledge of relevant happenings at other institutions, potential for growth and transferability, evidence that student learning does improve and that some work had been carried out. The university teaching and learning unit provided assistance in preparing a polished application. The proposal was to design and produce Thematic Physics Workshops based on the Workshop Tutorials. In consultation with colleagues from several Sydney metropolitan universities, we proposed developing and providing a coherent resource package which can be used at different institutions so as to improve student learning in both mainstream and service courses. Physics educators would have the flexibility to extract workshops appropriate to their syllabus and readily insert them into existing courses.

### **Current status of the project**

The grant application was successful and a Project Manager has been employed for two years. The Workshop Tutorials have been run successfully at the Australian Catholic University with students enrolled in environmental science, in the Department of Biomedical Sciences at The University of Sydney with students doing bridging courses, at the University of Western Sydney with several groups of engineering students and at The University of New South Wales with students enrolled in Optometry. Student learning experiences in the tutorials are being continuously evaluated to maintain a quality learning environment. The academic content of the worksheets themselves are being constantly evaluated and improved to produce an end product which is both correct and promotes conceptual understanding through collaborative learning. The methods of evaluation have been expanded to include minute papers and focus groups.

Presentations on various aspects of the project are being made at relevant conferences and meetings. In September and October 2001 the project team will run a series of workshops at various centres in Australia. The aim of the workshops will be to demonstrate the teaching and learning style and make available the teaching material that has been developed. Currently the schedule is to have two workshops in Melbourne on 24 and 25 September, one workshop in Hobart on 26 September, in Brisbane on 2 October, in Adelaide on 9 October and in Perth on 10 October.

### **Conclusion**

We have presented a perspective on the initiation, development and current status of a successful student oriented learning environment – the Workshop Tutorials. We have demonstrated that by

using results from on-going systematic evaluations, which in itself is a form of research, it is possible for a teaching development project to thrive. An awareness of educational research, and the inclusion of results from educational research further strengthens the project and improves the quality of dissemination. Successful internal small grants and presentations at conferences and internal meetings provide an environment in which interest is readily maintained. The opportunity then exists for larger scale interactions and collaborations.

The Workshop Tutorials provide a dynamic learning environment in which issues in physics education research can be investigated. Aspects of the workshops are available as research projects for students.

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## The HSC syllabus changeover and first year student experiences in physics and biology

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## Introduction

Student approaches to learning vary from surface approaches to meaningful, deep learning practices. Differences in approach may be related to students' conceptions of the subject, perceptions of the learning environment, prior experiences studying the subject and performance on assessment. Investigating these issues provides insight into student learning processes, a powerful evaluation and feedback process for improving tertiary science teaching and learning.