Using the web to enhance laboratory teaching

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Course structure

At The University of Sydney chemistry is taught as a practical based discipline and students spend approximately three hours each week in the laboratory. The laboratory component of the course is structured in three parts: the pre-laboratory work; a series of laboratory exercises; and the post-laboratory work.

- The students conduct the pre-laboratory work in their own time, prior to their scheduled laboratory class. The purpose is to provide background and theoretical backup to the experiment that will be conducted that week. The information is supported by a number of questions designed to test the comprehension of the student.
- The laboratory work is conducted in a three-hour block and introduces the students to important practical techniques as well as providing some experience of the concepts taught during lectures.
- The post-laboratory work is brief and usually consists of an analysis of the results obtained in the laboratory or a supporting problem. This is conducted in the student's own time.

Online pre-laboratory work

When the pre-laboratory work was print based, the laboratory tutors checked the work of each student at the start of the laboratory class. This took considerable time and detracted from the time available to conduct experimental work. We set out to design a means of hosting the pre-laboratory work online. This was to be coupled with a formative quiz, which could give feedback to the students at the time they were thinking about the material and alert tutors to individuals that might be having difficulties with a particular area. All of the time in the laboratory would then be available for practical work with the tutors able to focus on teaching practical skills.

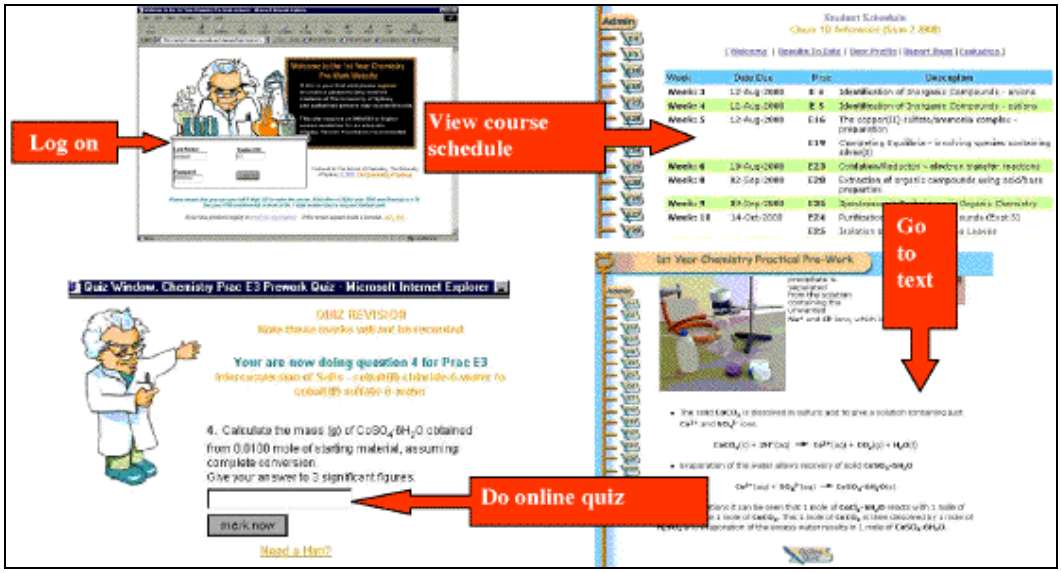

Figure1. Example of online pre-laboratory work page sequence

The online quiz

The students are required to complete the pre-laboratory work before coming into the laboratory and compliance with this is taken as submission of the online quiz associated with each practical

exercise. Each quiz has a 'due by' date to coincide with the date of the laboratory class. A student may complete the quiz after the due by date but the marks are not recorded. Similarly a student may return to any quiz for revision purposes and their marks are not recorded. The quiz contains between 3 and 10 questions. The quiz is intended to be formative in nature while still providing an incentive to the student to make an attempt at each question. If the student scores above 20% on the quiz they are given full marks for completing the pre-laboratory work. If a student scores less than 20% (likely if they randomly select each answer) they are credited with the quiz mark they obtained for completing the pre-laboratory work. The students see the mark they scored at the end of the online quiz and can compare it with the class average and the top mark, which are calculated at the time.

Student evaluation

Evaluation is, of course, an integral part of any development. An evaluation module was built into the application to request information of a technical and of an educational nature. During the alpha test of the application (semester 1, 2001, approximately 600 participants) 271 students completed the online evaluation, the vast majority (75%) indicating they accessed the Internet daily and that this was done from their home.

There was a range of evaluation questions relating to the content of the pre-laboratory work that students responded to, which allowed continued optomisation of the online resource. While the overall evaluation was very positive, it indicated where we should direct our focus to improve the online pre-laboratory work – there was a request for more extensive feedback to the quiz answers for example. We have been able to incorporate these modifications for the launch of the application to all of our first year students in 2002.

Our perspective

There has been a big gain in the useful laboratory time available to the students now that the tutors do not mark pre-laboratory work at the start of each session. Feedback from the tutors concerning this has also been very positive.

We are still experiencing some problems with the students incorrectly entering their identification number or laboratory details but these are generally easily sorted out. This online approach means that it is not possible for students to complete the pre-laboratory work while on the train travelling to their laboratory class however the requirement of a static environment is probably more conducive to learning!

Acknowledgements

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Reference

George, A. V. (2001) Online Preparation for Laboratory Work. *CAL-laborate*, **7**, 11-15, [Online] Available: http://science.uniserve.edu.au/pubs/callab/vol7/george.html [2002, April 4].