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**Practical Report**

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## Teaching First Year Biology at a Rural University Campus

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### Abstract

At Deakin University, first year Biology is one of the largest units and is taught at four campuses. At Warrnambool, Biology A (which runs in Semester 1) is taken by Science students taking three environmentally based courses as well as by Nursing students. This latter group of students takes Biology B in Semester 2. Here, we outline some of the features of the program including the web site and its associated interactive activities, the problems in teaching disparate groups of students in Biology A and in teaching students where most are living away from home and many are mature age learners who have not studied science for a long time.

**Key words:** *Australia, biology teaching, first year students, tertiary level.*

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### Introduction

Biology is one of the largest subjects taught at Deakin University and is taken by students who are enrolled in many different degree programs. As such it has to cater for students with different needs and backgrounds. Here, we outline the subject structure and some of its features including interactive web-based sites used to enhance student learning. As well we discuss issues in teaching first year Biology at Warrnambool, one of four campuses in which Biology is taught. Warrnambool is the most isolated of Deakin's six campuses, being some 283 km west of Melbourne with a population of around 28,000.

### The Subject Structure

The year's subject is divided into semester length units that comprise three modules each. In Semester 1, every student who takes Biology enrolls in Biology A that comprises three modules:

1. Cell Biology
2. Genetics and Heredity
3. Animal Systems

In Semester 2, students who take Biology select three modules which most suit their needs. Students who are, for example, enrolled in a Bachelor of Conservation Ecology can take the elective Biology C that comprises Biological Diversity, Plant Systems and Ecology. Nursing students, on the other hand, enrol

in these three modules:

4. Physiological Control Systems
5. Cardiovascular & Respiratory Systems
6. Defence, Digestive & Urinary Systems

At the Warrnambool Campus, only Biology A and B are offered. Biology A is taken by Nursing and Science students (for whom it is compulsory), but in Semester 2 only Nursing students enrol in first year Biology as science students take units which are designed specifically to meet their needs in ecology, ecophysiology and diversity.

### First Year Biology Online

An interactive web site has been designed to assist students in their learning. Students enter the site (<http://www2.deakin.edu.au/biology/>) using a user name and password. The site provides access to the following support materials:

- ★ Unit details (content, lecturing staff, assessment requirements etc.)
- ★ Unit schedule
- ★ Lecture notes for each lecture in rich text format
- ★ Quizzes for each lecture (multiple choice)
- ★ A set of Biology WWW links
- ★ Description of activities in *The Biology Place*

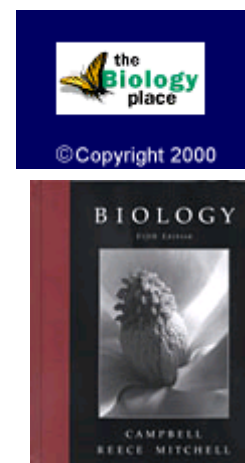
The textbook for Biology A is Campbell, N. A., Reece, J. B. & Mitchell, L. G. (1999) *Biology, 5th ed.*, The Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA; Figure 1)

The textbook comes with an interactive CD-ROM which provides useful animations of conceptually difficult biological processes. For instance, we use it to demonstrate action potential and nerve actions, muscle contraction (sliding filament hypothesis) and circulatory systems functioning. As well, the CD-ROM

has many useful quizzes and explanatory notes.

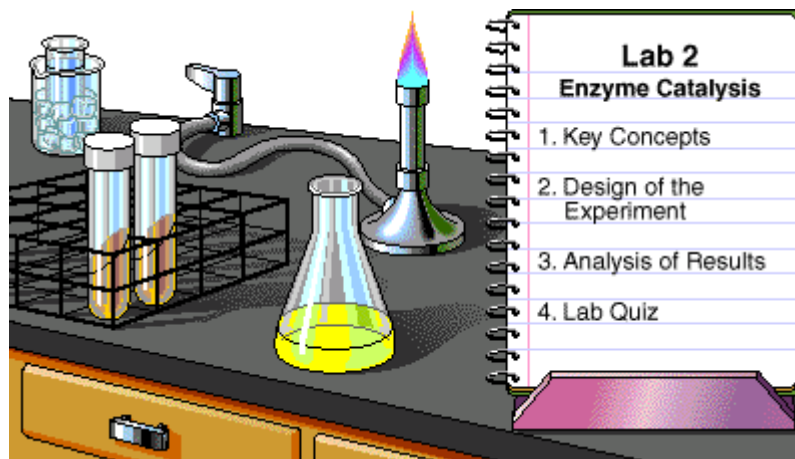
*The Biology Place* (<http://www.biology.com/home/home.html>) provides additional resources to assist students' understanding of the material in biology. The site is produced by Peregrine Publishers and contains the following sections:

- ★ BioCoach (review and practice components)
- ★ TestFlight (test bank of questions to aid review)
- ★ LabBench (simulated laboratory exercises, interactive. Quizzes)
- ★ WebQuests (web-based tutorial discussions showing real-life applications)
- ★ Learning Activities (resources to help learning)
- ★ Research & Reference (news articles)
- ★ Bulletin Board (questions, discussion group)



**Figure 1** Logo of *The Biology Place*, web site of the publishers of *Biology*

The LabBench is one facility we have used in Biology A at Warrnambool. Our technical staff had complained the practical activity in the prepared Biology A Manual was laborious to prepare and impractical to administer. We analysed the aims of the practical and found they did not include students actually acquiring



**Figure 2** Enzyme Catalysis, a computer simulated practical experiment from *LabBench in The Biology Place*

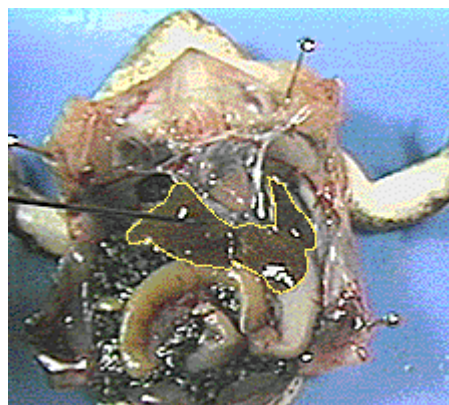
skills in the use of equipment (which are gained later); instead the main aim was in experimental design and data analysis. Hence we used the computer simulation *Enzyme Catalysis* (Figure 2) this year instead of the hands-on practical activity and it was regarded as being a great success by the unit's teachers.

Importantly the experiment has sections on lab safety as well as questions throughout on why certain procedures were being carried out. On average students took about 40 minutes to complete the exercise – a bit different to the 3 hours the laboratory experiment took and which rarely produced meaningful data!

One of the laboratory exercises students in Biology A must undertake involves dissecting dead Cane Toads to identify internal organs and body structure. Each year we have students who object to this exercise on ethical grounds. An alternative web-based simulated frog dissection is used for these students (Figure 3). The address is <http://curry.edschool.virginia.edu/go/frog/home.html>.

The textbook for Biology B is Martini, F. H. (1998) *Fundamentals of Anatomy and Physiology, 4th ed.*, Prentice-Hall, Upper Saddle River, NJ. It also comes with a CD-ROM

and its own web site <http://cw.prenhall.com/bookbind/pubbooks/martini4/>.



**Figure 3** Photograph of liver of a frog taken from *The Interactive Frog Dissection*

### Biology in a Rural Campus

Some of our students who take Biology at Warrnambool enter University with poor school science backgrounds or are mature age learners who are returning to study after spending time in the workforce or at home caring for families. These students often feel unconfident about science. Nursing students in particular, sometimes query the relevance of some of the science they learn and only come to appreciate its significance late in their course. We have designed special tutorials to

help them overcome their apprehensiveness and pass rates are similar to those in classes of students at other campuses. Warrnambool is also where science students studying three environmentally-based courses enrol and these students sometimes express concern at having to study such a laboratory based program so early in their course.

### **Problems with Teaching a Multicampus Program**

We have identified a number of difficulties in teaching units in first year Biology which are common to four campuses:

1. *The need for common lectures and assessment:* It is argued that the program must be identical to ensure comparability of standards and to make it easy for students to move between campuses in their course. This creates difficulties, however, as student needs differ. Even teaching students majoring in marine biology and nursing in the same classroom is difficult as each expects to learn about examples relevant to their chosen field. Exams are identical and held simultaneously at the four sites. The need for common learning programs and assessment imposes restrictions which could result in a course which does not meet the requirements of any of the student cohorts.
2. *Resources:* There is an assumption that each campus has access to the same teaching and learning resources, for example, practical materials.
3. *Centralized co-ordination:* There is appropriate devolution of responsibility.
4. *Student characteristics:* A higher propor-

tion of students studying at Warrnambool live away from home. At first year most choose to live in the student residences on campus. Anecdotal evidence suggests Melbourne-based students have greater access to computers and hence to the Internet and Deakin's own web site than Warrnambool students. This is because of the high number of Australian homes which now have PCs and on line access. Student class attendance at Warrnambool is also perceived by many to be lower than at Melbourne. Some staff has explained this is related to parental influence, others have suggested the outdoor attractions (especially surfing) at Warrnambool lure students away from the lecture rooms! A uniform curriculum has difficulty taking into account differences in student characteristics.

Finally, in Australia we have seen a steady decline in senior secondary school enrolments in what might be termed the *enabling* sciences of Biology, Chemistry and Physics. Whilst certain applied sciences, such as Psychology and Health and Human Development, have been seen increases in student numbers (Psychology is now the most popular science taken in the Victorian Certificate of Education – the final two years of secondary education), there has been an overall swing towards business and general education subjects and away from the traditional sciences. In the past we could confidently assume 90% of our year 1 University students taking Biology would have done Biology in their final year at school. We can no longer make this assumption.