

ONLINE LEARNING: THE FIRST YEAR BIOLOGY WAY

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ABSTRACT

Staff involved in organising courses with large student numbers have to cope with repeat lecture series, multiple concurrent laboratory sessions, seemingly never ending reports to mark and vast numbers of examination papers to grade. The sheer size can affect both staff morale and student learning, and may lead to impersonal interactions between staff (in ever dwindling numbers) and students (in increasing numbers). This is the situation for first year biology courses at The University of Sydney. Since the late 1980's teaching methods in first year biology have been changed to incorporate various scenarios which put the emphasis on student-centred learning in small groups in large classes. In more recent years this emphasis has expanded to include using computers in a variety of learning experiences on offer to students. This resulted in 'in house' development of computer-based learning and assessment materials for delivery on the first year biology intranet (within our laboratories and resources room). More recently still, the delivery mode has been moved from an intranet, to that based on the Internet to provide more flexible learning opportunities for our students. Using the Internet has enabled the establishment of a 'Virtual' Resources Room which mimics the "actual" Resources Room which is available to students on a restricted time basis. Moving the delivery mode to the Internet was partly in response to the lack of access many of students found they had to the materials (both computer and paper based) in the "actual" Resources Room. The virtual resources are available at all times and from any desktop machine with Internet access. The paper will illustrate the way the web is being used in first year biology to deliver course materials via a Virtual Resources Room. This web site enables access to learning resources such as computer-based learning packages, formative self-assessment and remedial modules, lecture notes and other course materials. The site also offers asynchronous electronic communication between the students and staff and between students and students. Usage statistics and student's perceptions of the web-based resources will be discussed.

KEYWORDS

Virtual resources, first year large classes, asynchronous communications, biology.

1. INTRODUCTION

“Effective university teaching is about making learning possible. There can be no excellence without changes in understanding. Changing understanding . . . can only be done by shaping experiences for students that encourage them to learn” (Ramsden, 1998).

In our changing world where university students are demanding a greater say in their tertiary education, and in particular are demanding a greater flexibility in the way they receive their instruction, it is imperative that we investigate and experiment with course delivery strategies that fulfil these expectations. Online delivery of learning materials is not new, nor is it the panacea for all problems, but it does offer teachers and students a more flexible mode that may suit certain teaching activities but more importantly may suit the learning style and commitments

of some students. A mix of face-to-face activities and online activities together form the basis of many university courses today. Candy, Crebert and O'Leary (1994) suggest that courses which enhance lifelong learning must offer some flexibility in structure and provide for development of self-directed learning. They state that teaching in such courses must make use of open learning delivery mechanisms, where appropriate, and should make use of peer-assisted and self-directed learning. Open Learning is defined by Paine (1989) "as a process which focuses on access to educational opportunities and a philosophy which makes learning more client and student centred". This means that not only is access to education made more equitable but also that the experience is more flexible. Fraser and Deane (1997) suggest that flexibility in teaching and learning can be provided in a number of ways, which include the resources made available for learning, the interaction between learners, and the support provided for learners. Lewis (1993) suggests that changes that would allow a more flexible approach include: improved access to learning resources; provision of flexible student support systems which should include counselling services, bridging, catch-up, remedial and study skills courses; and the development of learning resources and experiences that cater for different learning styles. Lewis (1993) also suggests that the educational aim of 'student centred learning' should also be included under the umbrella of flexible learning with the aim of helping individuals take responsibility for their own learning.

For the modern university student, a full campus life is not necessarily a dominant aspect. Some students travel long distances, many live on relatively low incomes, often paying significant proportions of their incomes in rent whilst others are in paid employment (McInnis, James and McNaught, 1995). It is apparent that, in the current economic climate, many students have to juggle university commitments with employment, potentially missing some of the structured teaching and learning sessions and, more importantly, not being able to take advantage of campus-based course materials and face to face assistance from staff. A small shift away from courses comprising all face-to-face teaching to courses with more flexible access to teachers and learning materials has the potential to help those very students who may otherwise give up when the pressure of time and other commitments seems too difficult to cope with. McInnis *et al* (1995) found the pressures of part-time work made it extremely difficult for some students to fulfil course expectations. A 1998 survey of first year science students at the University of Sydney showed that 54% of full time students are undertaking some form of employment, with 31% of all students working 10 hours or more per week, and 14% working over 15 hours per week (Peat and Franklin, 1998).

Currently student retention and progression is one of the most pressing concerns for higher education. McInnis *et al* (1995), in their Australian benchmark survey of the first year experience, found that over one third of students had seriously considered deferring in the first semester. Their survey showed that the causes for students leaving are many and diverse, including change of intentions, uncertainty of future, other commitments, lack of adjustment, academic difficulty, academic boredom, financial difficulty, and isolation. These are compounded for students who are unable, for various reasons, to take full advantage of what is being offered on campus. Annual national surveys of graduates show that nearly half of those graduating for the first time report that feedback was mostly in terms of marks (Course Experience Questionnaire data). Opportunities for helpful feedback on student progress are often limited and are becoming more limited as the system becomes more strained, with classes becoming larger, and dollars for teaching becoming more scarce. One way to help solve some of these problems is the judicious use of the Web. Online materials on the Web allow for the delivery of some course materials in both 'book' mode and interactive mode, a means of doing formative and summative assessment, and a means of offering asynchronous communication channels for student-student and student-staff interactions.

Since the early 1990's First Year Biology at the University of Sydney, along with the rest of the 'innovators' (Alexander, 1998), has utilised computers in educational settings and this has led to an explosion of material and delivery modes. Initially First Year Biology introduced computer-based learning modules (on stand-alone hardware in the laboratory) to help students understand topics which are difficult to conceptualise and are often difficult to demonstrate to thousands

of students in the laboratory. Later on the advantages of encouraging students to take responsibility for their own learning and enhancing group learning skills were seen as powerful arguments for continuing to exploit the technology. First Year Biology then developed an intranet connecting the teaching computers to a file server, thus enhancing management and delivery of these modules. More recently a connection to the University intranet enabled more flexible access for students anywhere across the University's (virtual) network (e.g. from the residential colleges as well as the teaching laboratories and student resources room). However, even after this development we were still continually bombarded with requests for lending or purchase of our materials for use at home and for access outside of University opening hours.

During the past 20 years First Year Biology has provided a room for students to access teaching and learning resources such as computer materials, paper-based materials, tapes and overheads from lectures, models and microscopes, reading materials and other resources. This resources room (open six hours per day, Monday to Thursday) is the only out-of-laboratory access students have to first year biology teaching and learning materials. During the hours that the resources room is open a staff member is rostered for face-to-face consultations should students need additional assistance. With the rapidly increasing use of the Web, First Year Biology decided to move the resources room online, in response to a need to keep it 'open' longer. Moving the resources room 'online' subsequently led to a new focus on communication, offering both a novel email link from students to supportive staff and a mechanism for student-student interaction. In addition this allows the students a flexibility of use that the 'actual' resources room could never offer.

This paper will describe online teaching and learning material for first year biology students, which are accessed via a user-friendly 'Virtual Resources Room' and are thus available to enhance the student experience by providing flexible learning opportunities helping to train students to be independent learners.

2. VIRTUAL RESOURCES ROOM

The virtual resources room (VRR) is a web site accessed via the First Year Biology web address: (http://fybio.bio.usyd.edu.au/FYBSOBS/FYB_welcome.html). When students enter the VRR (Figure 1) they see a virtual room with all the conventional resource room facilities. It has typical learning equipment such as desks, computers, blackboards, bookshelves and so on, and contains many of the resources that are available from the 'actual' resources room.

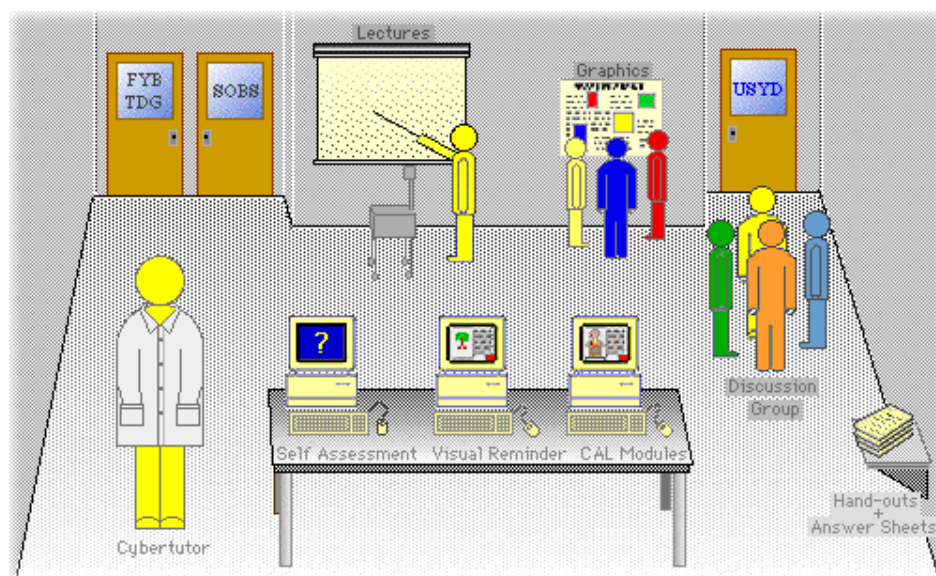


Figure 1: The 'Virtual Resources' Room.

The VRR is available to all users, however students must log in with a User ID and Password to access the lecture note resources.

In the ‘actual’ resources room materials are located and lent to students by the room attendant, much like in a library. In order to mimic this situation the ‘virtual’ resources room has been provided with a search engine to enable students to locate materials. The provision of this search engine has also allowed students to locate information more quickly than the ‘actual’ resources room allows. For example students can search for a particular topic within a lecture, within a first year biology course.

Some general perceptions of the VRR from students via email and open ended questionnaire are:

“It’s an awesome idea”

“This site is very impressive and better than I could have expected”

“It’s the best assistance program on the campus”

“.....can be accessed at any time from home, night or day”

3. ONLINE TEACHING AND LEARNING MATERIALS

Prior to the development of the Virtual Resources Room all our resources such as lecture tapes, copies of overheads from lectures, handouts, computer-based modules, etc. were loaned to students from the actual resources room which acted as a limited access library for these materials. Currently all these materials, and more, are available 24 hours per day over the Internet.

3.1 ‘PAPER-BASED’ MATERIALS

Course timetables, handouts associated with both the lectures and laboratory sessions, and lecture notes are all available in the VRR. Handouts include electronic versions of all the paper-based materials available in the actual resources room, such as answers to homework and self test quiz questions, copies of the sample examination papers for the various courses and materials required for assignments. Lecture notes (Figure 2) are posted on the web after the lecture has been given. The format varies from lecturer to lecturer; some are full transcripts; some are in point form only; and some are interspersed with questions. Lecture notes on the web are not intended to be used as a substitute for attending the lectures as not all the details or visual aids (slides, transparencies) are included, but they are an adjunct for revision. The lecturers’ email addresses are included so the students can contact them directly if they wish.

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HUMAN BIOLOGY

LECTURE 34 - TIMING AND CONTROL OF HUMAN DEVELOPMENT

LECTURER: [DR. MARY PEAT](#)

Lecture 34 - Timing and control of human development

Recap - passage of the early embryo to the uterus

Fertilisation of the human egg takes place in the fallopian tube or oviduct.

Passage of the cleaving egg along the oviduct into the uterus takes 2-4 days.

Overhead 1

The main agency of movement - is ciliary action by the lining of the oviduct, but some slow peristalsis of the oviduct also occurs.

By the time the embryo reaches the uterine cavity it is at the blastocyst stage.

Tovulation is usually completed by 2 days after

Polar body
Blastomere
Zona pellucida

Two cell stage

Four cell stage

120µm diameter

CLEAVAGE

Figure 2: Example of lecture notes available from the ‘Virtual’ Resources Room.

The most frequent, positive perceptions of students, concerning the most useful/worthwhile aspects of the VRR relate to the availability of the lecture notes:

“...catch up on missed work”

“access to lecture notes, practice questions, and other useful information.”

“If I have missed out on anything, I can find them in the VRR and have my independent study there.”

3.2 COMPUTER-BASED LEARNING MATERIAL

Since 1992 three styles of computer-based learning modules have been created and evaluated (Franklin and Peat, 1995; Franklin, Peat, Mackay-Wood and Chambers 1996). They are: tutorials, which are designed to be resources for students to use in conjunction with paper-based materials; pre-lab modules, which are introductions to the use of laboratory equipment or procedures allowing students to practise using the equipment on the computer prior to using the laboratory-based equipment; and revision modules, which review practical material (in particular prepared microscope slides) previously seen in the laboratory.

A special form of revision module is called a SAM (Self-assessment Module) and these SAMs enable students to take a series of formative tests and exercises aimed at helping them monitor their level of understanding of major biological concepts (Franklin, Peat, Mackay-Wood, 1997; Peat, Franklin and Mackay-Wood, 1997).

3.3 FORMATIVE MID SEMESTER EXAM

The aim of the formative examination (Figure3) is to familiarise students with examination format and typical content, give them feedback on their understanding of the course concepts, allow them to take appropriate remedial action if necessary, help them feel less stressed about the end of course exam, and, hopefully, allow them to achieve at a high level in the final course assessment.

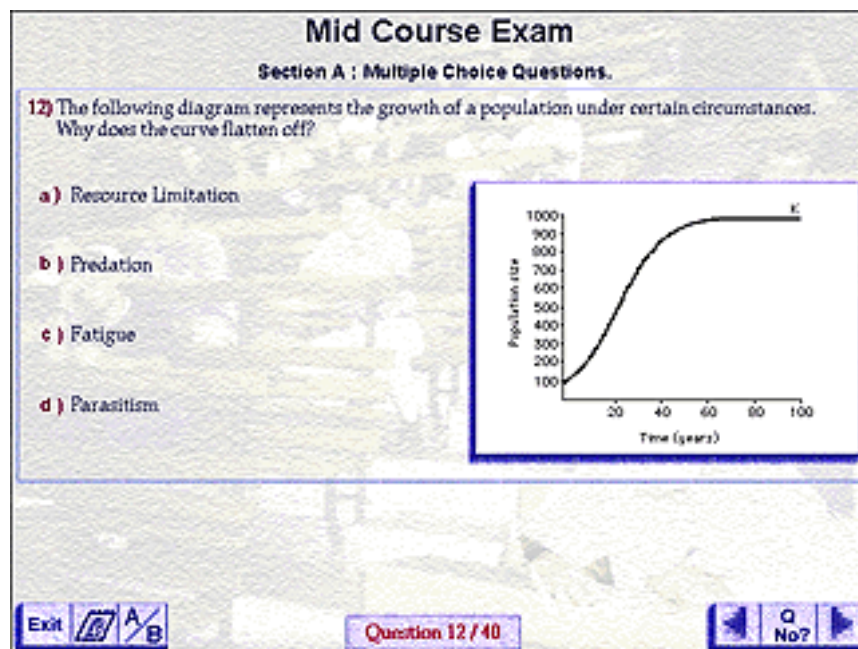


Figure 3: Part of the formative mid semester examination on the web

3.4 REMEDIAL MATERIALS

Students, who believe their performance in the formative mid semester exam to be less than desired, are encouraged to use web-based remedial materials which are aimed at enhancing understanding of major topic areas covered in the first semester course. The remedial materials comprise: a tutorial; a glossary of terms used for the particular section of the course; and questions (with hints and answers provided). These remedial materials do not cover all the material in the course but have been selected to include the topics considered by staff to be amongst those that students find the most difficult. They can be used by any student but they have been designed specifically for those in greatest need.

Student perceptions of the formative mid semester exam and remedial materials were generally positive but a number of students experienced difficulties in making the materials run on their computers. In order to run the mid semester exam it is necessary to download the program 'Shockwave' which is provided free from the net.

In response to the question "What aspects of the VRR were the least useful" students responded:

"requiring us to download the shockwave program"

"..difficulty in obtaining answers for mid course test"

This issue was resolved by placing instructions on the VRR on to how to download the program 'Shockwave'.

4. COMMUNICATION VIA THE VIRTUAL RESOURCES ROOM

Communication between students and staff has relied in the past on face-to-face meetings. For many reasons this is becoming impossible for some students and an electronic asynchronous mode is becoming more popular.

4.1 CYBERTUTOR

CyberTutor is set up to offer students a means of communicating with staff. Students who have an email account can send messages to staff to ask questions about the course content and organisation. Staff check the CyberTutor email inbox and reply to any questions, usually within a day or two. Students are advised that questions need to be specific and not require long detailed answers. If the question is too broad or will require a long answer they may not get the answer they want or the CyberTutor will recommend they come in for a face-to-face consultation. If CyberTutor cannot answer student questions on the lecture material then the email is sent on to the relevant lecturer with a 'cc' to the student so that they know where their question has gone. The staff remain anonymous, allowing for the involvement of several staff acting as CyberTutor during the course of the semester.

4.2 DISCUSSION GROUP

A discussion forum is set up for student use. This encourages students to access each other in real or virtual time, and allows students to post questions or discuss any topic with their peers. Students can either join a topic currently under discussion or start a new topic for discussion. Each topic under discussion, highlighted in blue, is followed by the date and time of the last posting. Students can click on a topic to check out what has been discussed and follow-up with comments of their own. The discussion area is not routinely monitored by first year biology staff.

5. STUDENT USAGE AND PERCEPTIONS

Students (n=240) were surveyed towards the end of the first semester in 1998. Over 70% of students indicated they had used the VRR and 77% of those students rated it as 'good' to 'very good' for their learning. Of the students who visited the VRR, 6% used the email facility to communicate with staff, 12% used the discussion group to communicate with their colleagues, 47% used the self-assessment modules and 86% used the lecture notes. Students who visited the lecture notes used them for a variety of purposes including reading them only, printing them out and for catching up on missed materials.

In 1998, 43% of students surveyed marked the formative mid-course examination before the end of the semester, and of those who marked the examination 37% used the web-based materials whilst the others used the paper-based materials provided. The web-based remedial tutorial materials were used by 34% of students to help increase their understanding.

Of the students who visited the VRR, 82% agreed or strongly agreed that the VRR gave them easy access to first year biology materials; 55% agreed or strongly agreed that the VRR gave them useful feedback on their learning; 59% found the VRR provided them with useful material for areas with which they have difficulty; 41% were uncertain that the VRR offered them relevant materials that supported their other learning experiences; 70% thought the materials on the VRR supported their learning in lectures; and 79% liked the flexibility of accessing biology resources at any time of day.

Students also sent unsolicited comments by email on their perceptions of the Virtual Resources Room such as:

“Biology web site extremely useful and well organised”

“You have done an absolutely fantastic job...I appreciate it very much and so no doubt do many other ‘silent’ students”

“Overall this message is mainly to compliment the staff on an excellent set of resources and to encourage you to continue developing them”

“In response to the idea for putting the CAL modules online. I think it’s a wonderful idea. I can’t express how great I think that idea is...”

“Just a note to say thanks. FYB definitely makes more (use) of the online resources than most other subjects”

6. DISCUSSION

University teaching and student learning are moving through transition processes, driven by many factors including changing student requirements and economic forces. In first year biology we have tried to accommodate a more flexible delivery for some of our materials, such that our students can choose when they want to be engaged in these activities. To this end we have introduced strategies for setting up learning communities in large classes which include creating small peer working groups; group laboratory experiments, field work and poster presentation; specially designed card and board games and computer-aided learning materials designed for use in peer groups (Franklin and Peat 1996). We are using the technology as an adjunct to the learning process, allowing students to learn in a way that suits their lifestyle and which we hope will enhance opportunities for participation in higher education. Moving part of the total course materials to the web stimulated us to design web-based communication capabilities, as an adjunct to face-to-face contact with students. It is felt that some students may feel more comfortable communicating electronically with staff while others may never use the facility.

First year biology aims to mix virtual learning on the Internet with real life, face to face learning in practicals and lectures, but with an emphasis on accessing virtual learning resources. Using the web for the delivery of teaching and learning materials has led to an increase in flexibility for students using the materials. Students now have greater access to the materials than previously as our online facility is open 168 hours a week as opposed to the ‘actual’ resources room which is open for limited times (24 hours per week) and the space limitation of the latter is not an issue with the web version. Depending on their preference, students can now access all our teaching and learning resources either via the ‘virtual’ resources room or as paper-based or computer-based material in the ‘actual’ resources room. Thus students without Internet access are not disadvantaged.

Moving the materials onto the web is in line with the University of Sydney, Faculty of Science policy on equity of access and availability of teaching materials. Access has been greatly enhanced by the opening of student computer laboratories (one with 24 hour a day access) across the University campus. This has enabled students without home-based computers, who previously may have been disadvantaged, to have 24 hour access to the web. In 1998, a survey of first year biology students at The University of Sydney showed that 89% of students have computers at home, but only 54% of students with computers at home are linked to the Internet. However, 62% of those students without the Internet at home use networked computers provided on campus to access the Virtual Resources Room. Another 10% of students access the Internet in the first year biology resources room. It is assumed that the number of students with Internet access at home will increase each year. Australian Bureau of Statistics (1998) data show that the number of Australians with the Internet at home has quadrupled in the past two years. These data show that 250,000 homes were connected to the Internet in 1996, with this number increasing at a steady rate to 1.038 million in 1998. It is assumed that this will be reflected in increasing numbers of first year biology students with Internet access at home.

Presenting materials in this non-confrontational, user-friendly way offers students the benefits of different learning modes, depending on their preferences. They can test themselves using self-assessment packages: they can 'read' lectures they may have missed: and if they want to interact with other students or staff, they can use the discussion group or CyberTutor. All of these activities put the onus on the students to take responsibility for their own learning, but in a way which caters for all learning styles. The students have indicated their appreciation of our efforts and have, through the use of CyberTutor, given us many ideas for further improvements. Thus we are moving towards a closer partnership with our students in these endeavours.

"To produce graduates equipped for the workplace, it is essential that educators teach in ways that encourage the learner to engage in deep or meaningful learning, which may be built on in the later years of their course, and also be transferred to the workplace." (Fraser and Deane, 1997)

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8. REFERENCES

- Alexander, S. (1998). Internet-based Teaching and Learning: the past and the future. *Proceedings of University Science Teaching and the Web Workshop*, UniServe Science, Sydney April 1998, 5-6
- Australian Bureau of Statistics (1998). Household Use of Information Technology, Australia (8128.0)
- Candy, P. C., Crebert, G. and O'Leary, J. (1994). *Developing Lifelong Learners through Undergraduate Education*. National Board of Employment, Education and Training. Australian Government Publishing Service
- Franklin, S. and Peat, M. (1995). The Use of Multimedia in the Teaching of First Year Biology: Learning with Technology. *Proceedings of ASCILITE Conference 1995*, Melbourne, 171-177
- Franklin, S., Peat, M. and Mackay-Wood, R. (1997). Assessment using computers: the First Year Biology way. *Proceedings of UniServe Science Computer Assessment Workshop*, The University of Sydney, NSW, 36
- Franklin, S., Peat, M., Mackay-Wood, R. and Chambers, D. (1996). CAL Modules in First Year Biology at the University of Sydney. CUBE'96 International Conference (Computers in University Biology Education Internet Conference).
- <http://fybio.bio.usyd.edu.au/sobsfyb/fyb/tdg/cube96/franklin.html> (Australian mirror site)
- Fraser, S. and Deane, E. (1997). Why Open Learning? *Australian Universities Review* 1, 25-31
- Lewis, R. (1993). The progress of open learning, *Education and Training*, 35 (4), 3-8

McInnis, C., James, R. and McNaught, C. (1995). *First Year on Campus: Diversity in the initial experiences of Australian undergraduates*. A Commissioned Project of the Committee for the Advancement of University Teaching, September 1995. Centre for the Study of Higher Education, University of Melbourne

Paine, N. (1989). Preface, in N Paine, (ed), *Open Learning in Transition: an agenda for action*, London, Kogan Page

Peat, M., Franklin, S. and Mackay-Wood, R. (1997). The Development of Self-Assessment Modules: use of tailor-made templates. Virtual CUBE'97 International Conference (Computers in University Biology Education Internet Conference).

<http://www.liv.ac.uk/ctibiol/vCUBE97/home.html>

Peat, M. and Franklin, S. (1998). Report to the School of Biological Sciences Teaching Committee: 1998 Survey of casual hours of work of first year students, June 1998

Ramsden, P. (1998). Inaugural Professorial Lecture, 23 April 1998, Griffith University

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