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ABSTRACT

Five papers focussing on educational technology are presented in this issue. "Computerised Instructional Technologies: Considerations for Lectures and Instructional Designers" (Helen Geissinger) and "The Higher Education Distance Learner and Technology" (Terry Geides) locates the new technologies within a solidly grounded educational context. These technologies include: hypermedia, interactive media, CD-ROM, and electronic and voice mail. A high priority is placed on educational concerns and the learning environment of the student. "Internet Relay Chat (IRC)--A Real-Time Multi-User Computer Collaborative Learning Medium" (Simpson Poon) and "The Voice Mail Trial in Distance Education Courses at Charles Sturt University" (Peter Donnan) focus on innovative computer technologies, internet relay chat (IRC), and voice mail. These technologies enhance the interactive dimension in course offerings and may be of interest to many open and distance learning providers. "The Modularisation of Microbiology--Prologue" (Sue Davies, Terry Harden, and Lesley Ballantyne) documents Charles Sturt University's ongoing experience with modularisation. This paper is a case study and examines the benefits and difficulties of the modularisation project. All of the papers include references. (TMK)

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CONTENTS

EDITORIAL COMMENT

This issue of *Occasional Papers in Open and Distance Learning* focusses on educational technology. Three of the papers were presented by CSU staff at the Australian and South Pacific External Studies Association's 11th Biennial Forum on *Distance Education Futures* held in Adelaide 21-23 July 1993. The conference was attended by in excess of 270 representatives from universities in the Australasian region and one of the sub-themes which emerged was the challenges encountered by many institutions in a transition era where much higher enrolment numbers are being experienced at the tertiary level.

Charles Sturt University has responded to these challenges by exploring innovative modes of course delivery. In particular it has turned to educational technology which offers many ways of enhancing the qualities of interaction and communication in open and distance education courses. This theme surfaces in four of the five papers.

The first two papers locate the new technologies within a solidly grounded educational context. With an increasing and sometimes dazzling array of technologies available in the educational market place, such as hypermedia, interactive media, CD-ROM, electronic and voice mail, there is a possibility that the basic educational realities may be obscured. The first two papers place a high priority on educational concerns and the learning environment of the student but they also introduce the complexities of the debate within a critical framework.

Paper 3 and paper 4 focus on innovative computer technologies, internet relay chat (IRC) and voice mail; these technologies enhance the interactive dimension in course offerings and will be of interest to many open and distance learning providers.

The final paper documents Charles Sturt University's ongoing experience with modularisation. This paper is a case study of a modularisation project involving two schools in the Faculty of Science and Agriculture and this innovative project affected both the distance and internal offerings of the subject. The benefits, as well as the difficulties encountered, are well worth examining.

Peter Donnan
Editor

A CALL FOR PAPERS

Charles Sturt University staff are invited to submit a copy of any material for publication in the next edition.

Please forward papers to:

Peter Donnan
Editor
Occasional Papers in Open and Distance Learning
Open Learning Institute
Charles Sturt University-Riverina
PO Box 588
WAGGA WAGGA NSW 2678

Enquiries please ring **(069) 22 2338.**

Computerised Instructional Technologies: Considerations for Lecturers and Instructional Designers

Helen Geissinger
Open Learning Institute
Charles Sturt University - Mitchell

This paper is written in response to a number of articles about instructional technologies which discuss only the technology and ignore instructional concerns.

INTRODUCTION

Computerised instructional technologies have been evolving for some time. They have progressed from Skinnerian programmed learning programs to present-day interactive multimedia presentations. On the way, they have spawned an alphabetic stew of acronyms and a terminology which tends to alienate and exclude those who are not already in the stew. A small glossary is included so that you, as reader, will know what the terms mean as they are used in this paper.

Glossary:
CAI (computer-aided instruction) - instructional activities on computer software. The instructions for the activities and descriptions of outcomes are all given on the software. The software may be 'interactive' to the extent of offering questioning activities which contain built-in responses to the choices the user makes. CAI tends to consist of small blocks of content followed by questions and answers (Q&A) followed by more small blocks of content, etc.
CBL - computer-based learning (same as CAI)
CML (computer-managed learning) - instructional activities are presented through the computer. An e-mail bulletin board lists the components of the course and their location. For example, they may be diskettes, tapes and a textbook sent through the mail. The activities may consist of the writing of word-processed essays, utilisation of spreadsheet software and financial data, problem-solving in simulated situations, and/or utilisation of database software. Student work may be submitted via e-mail (electronic mail). Communication with the lecturer, the institution and other students is through e-mail, as are conferencing and tutorials.
Multimedia - (i) computer software containing course materials which incorporate text, graphics, animation and sound; (ii) alternate: subject package containing several media, such as print, AV tapes, diskettes.
Interactive multimedia - the same meaning for (i) multimedia as above plus the built-in capability for the user to interact with the presentation, i.e. s/he can answer questions, manipulate certain components and choose activities from a menu, i.e. 'branches' which give content or practice of skills on a number of levels. Q&A activities may lead to a 'diagnostic' answer to the student which identifies further study needs.
F2F - face-to-face, a term used for interactions between people facing each other, such as on-campus lectures, seminars and tutorials.
Techno-creep - When computer terminology creeps into people's vocabularies and takes the place of ordinary words, i.e. 'user friendly' in place of 'easy'.

It is reasonable to use new technologies where old ones are inadequate or inappropriate for the identified application. When print was the only available technology, learning materials for students at a distance could consist of lecturer's notes and list of recommended books. All courses which involved the impart of skills and knowledge not easily learned from the printed page could only be offered F2F.

In this decade, instructional designers and other academics must face the requirement to develop teaching methods which work effectively through computer technologies. The people who comprise the 'new' student body have different needs from students of the past. They need to get education where they live and they have many learning needs to fulfil. More and more people have access to good quality computer equipment and are willing to use it for their education. The quality of the content of the software they are given as well as its ease of use can help them enormously with their learning.

Lecturers and instructional designers have not found a 'one, right' model or theory to satisfy all the needs of teachers and learners (Meacham, 1989). It is not surprising, therefore, that the various new technologies each have supporters and detractors. Lecturers and instructional designers have expressed a number of opinions on both sides. Some of these are discussed below.

Opinions favourable to the use of computer technologies

a. Better presentation for certain types of content: a lecturer's notes can be translated into on-screen presentations such that they are more visually interesting. Readers can 'page' through; visual stimuli deliberately inserted help keep the reader alert. Students can print their own copies as they wish.

b. Individualised instruction: some aspects of teaching can be delivered with more immediacy, i.e.well-designed computer-marked self-assessment can give both immediate feedback and advice. Q&A can offer much branching, allowing a learner to pursue the assessment of his/her knowledge to a diagnostic answer. For example, if s/he gets a number of wrong answers, an easier level of questioning or a set of remedial materials can be accessed, along with advice on reaching a better skill level. If s/he gets all the answers correct, s/he can 'branch' to questions which involve more skill and knowledge or can get advice on ways to pursue the topic in more depth.

c. Reflection - The student can examine the concepts presented by the lecturer more closely and with a longer reflection period on-screen than in F2F class. For example, a lecturer who develops a schematic diagram can give print copies to the F2F group and then can put the schema on an overhead projector and annotate it. Learners may or may not annotate their own copies correctly. If the concept is not represented elsewhere the way the lecturer wants the learners to conceive it, there is no back-up resource for the learner except individual contact with the lecturer. On-screen, the diagram may be presented in several stages, i.e. the original, the first set of annotations, the second set, etc. The student can scroll through the presentation and watch the schema build as many times as s/he needs to help him/her reflect on the concept.

d. Contact - E-mail access to lecturers gives learners opportunities to ask questions about specific aspects of the material and receive individual answers. If a lecturer gets several enquiries about the same point, s/he can respond by offering a clarification to all students in the class via e-mail. Students can receive this message at any time, whereas a clarification given in a F2F group is not necessarily available later to a person not present at the time. A feature of distance learning is the fact of being non-contiguous, that is, the student and the lecturer send communications to each other at separate times. When students use the telephone, often the lecturer is unavailable. When they use e-mail, the communication is provided in print and remains on the system as a record.

e. Variety - Many more subjects can be offered via interactive multimedia than via print alone. For example, the study of music (especially technique) is much more accessible to students when animation and sound allow the learner to see and hear good examples. They can submit tapes of their own technique for assessment and feedback. Even where practical sessions are required, as Purches (1993) noted in her description of Social Welfare program requirements, interactive media can prepare students more fully for the on-campus experience.

But there are also drawbacks.

Opinions unfavourable to the use of computer technologies

a. CAI is difficult for lecturers to learn to use. They can become beguiled by their expertise when they have developed it and wish to use it for many topics. CAI may not be appropriate for some topics. Alternatively, it may be appropriate but much more expensive than an equivalent presentation in another medium.

b. There are several different types of instructional development software and many different software package capabilities within the software type. An institution which chooses one software package is limited to its capabilities, to the technology it requires, and to the expertise users may develop (or neglect to develop). For example, the practitioner may not develop skill in using all the capabilities of the package or may not understand how particular capabilities can enhance the teaching/learning process.

c. There is no 'one right way' to go about choosing instructional software or the technology needed for it. Decisions about hardware lead to decisions about software and vice versa. Once funds have been spent, the decision-maker is committed to a certain set of instructional outcomes. An inappropriate decision can lead to unwanted outcomes and the need to spend more money to rectify the situation or to face its abandonment. Often, the CAI is the result of compromises among instructional designers and lecturers who have wrestled with the limitations of the software and the hardware. The results they produce may satisfy a short-term need, but may be inadequate for the longer term.

d. People have the perception that there is much bad CAI 'out there'. CAI is expensive. Therefore, people who produce software under the conditions described in 'c.' above may not be able to afford to revise or update it. So the short-term use willy-nilly becomes long-term, to the detriment of learning when students are required to use it -- and to the detriment of the reputation of the institution which provides it.

e. As with other technologies, research into effectiveness in producing defined outcomes and user satisfaction is limited by factors such as: poorly-designed research, lack of sufficient numbers of learner responses, academics withholding results perceived as unfavourable to them, and learner perception of satisfaction which conflicts with lecturer perception of it. If studies are done, they are often tailored to 'prove' that the particular technology fills a need; they do not compare the various technologies in the light of teaching/learning principles and cost benefit analyses.

f. Training is time-consuming. The length and type are often seriously underestimated. For example, practitioners need to learn instructional design and question-bank development for computer technologies as well as screen design and methods of integrating sound and animation. People who invest the time and effort into learning the software have to use their skills or they tend to lose them. Hence, once an institution has provided training in the development of computer multimedia, it tends to put pressure on practitioners to develop more software.

THE REAL WORLD

This techno-creep term 'real world' usually denotes what happens in a certain setting under certain conditions. Teaching could be said to take place in the 'real world' of a classroom but the act of teaching does not deal with the real world. It deals with the teacher's perceptions. Teachers and instructional designers have perceptions of students' needs, knowledge requirements, effective methods of assessment, and so on. They do not know whether CAI and interactive multimedia cause the learner to feel even further from the 'real world' or simply act as another mode of teaching, perhaps even on a par with F2F teaching. We have all experienced excellent F2F teaching and also experienced the opposite. Computer technologies offer the same range of quality, but they are consistent in their mediocrity or their excellence. F2F presentations can vary widely in quality as a semester proceeds.

MYTHS ABOUT COMPUTER TECHNOLOGIES

Lori Gillespie made a down-to-earth presentation at the ASCILTE 92 conference in Sydney (ASCILTE Newsletter, 1993). As principal of a firm which specialises in instructional technologies, she has wide experience with the issues around computers and teaching/learning. She noted that many myths have sprung up around the technologies currently on the market. Some of these are: They will deliver an immediate payoff or return on investment; save lots of time and money; and can be developed as quickly as regular instruction. Also, instruction is more motivating and effective in CML; it is the answer to all instructional needs; it 'is designed just like regular instruction, except you use a computer'; 'only content experts can develop good CBL'; 'an authoring system will not allow me to create bad courseware', etc.

Many of these myths have sprung up because people, as ever, want an easy answer. The computer world is filled with people who have something to sell and the words, displays and ploys with which to sell it. Instructional designers and teachers are no different from other consumers. They look at the products, listen to the hype, become beguiled by the promises and mishear the caveats. They are bemused by the many terms.

Another glossary:
Authoring language - a software 'language' which tells the computer to produce certain results in response to certain commands. A practitioner has to use the language to 'write' instructional activities, such as the input and presentation of questions and appropriate answers. A number of languages have been developed for different applications, such as TenCore and PLATO.
Authoring system - a software program which employs little pictures, called 'icons' or 'buttons' to represent instructional activities. The system may be easy to learn to use, compared with an authoring language. For example, a practitioner wanting to set up Q&A would activate the requisite button and a template would appear on screen with spaces for the questions to be inserted, followed by a template for the answers. A student's incorrect responses would be dealt with in a certain way, while correct answers would elicit confirmation.

WHICH TO USE?

The answer to this question depends on the scope and variety of the learning activities the designer and the lecturer see as being necessary for the subject. Authoring systems are relatively easy to use and offer a range of attractive features. Authoring languages are more time-consuming to learn but they offer flexibility and a chance to move away from the strait-jacket of template usage.

It is very reasonable at this stage to ask whether or not the whole computer technology situation is a scam. People have gained much knowledge and skills in many fields without it, so do we, as instructional designers and lecturers, really need to go through all this authoring business?

The answer is 'probably'.

There are many topics which can be developed in CAI or more interactive forms which will be of consistently good quality. The questioning developed to go with these topics can be quite sophisticated, as skill develops on the part of the practitioner. The caveat lies in the 'completeness' of the computer software. Often, it will comprise only one part of a learning package. Tapes and textbooks will be other parts of the physical package, while interaction via e-mail and conferencing will also be a necessary feature. The student will get a well-rounded learning experience through working with the several components which each address the content in appropriate ways.

COSTS

BUT the cost of the finished learning package, not to mention on-going revisions and corrections, will be much higher than the cost of the media to which we are accustomed. The number of people involved in its development will have jumped. The instructional designer and lecturer are backed by a graphics designer (often) and word-processing staff for the production of master copies of print materials. For the computer technologies, the lecturer and instructional designer are joined by the graphics designer (a necessity, not an option), an audiovisual technician (or more), a computer technician and a lot of expensive computerware.

As the technologies permit the universities to reach more students, the costs rise, because properly-utilised technologies are not cheap. If the quality of the learning materials goes up, the students' positive learning experiences lead to satisfactory outcomes, which should benefit the university in a number of ways. Satisfied students are good advertisements for the 'home' university; they are motivated to achieve good results; and they complete their courses. Subject materials can be used in open learning, that is, they can be used on-campus as well as off-campus, and will deliver a consistent level of quality.

MISSING: THE ONE, RIGHT ANSWER

There is no one, right answer to this dilemma of which technologies should be used, just as there is no one, right model which can predict learning success. Perhaps the answer is to travel the middle of the road. Provide a variety of media including computer software for each subject and develop interactivity with the lecturer and the campus through dependable electronic links. Then develop some interactive multimedia subjects (perhaps using contract staff to develop them) and conduct comparative research to determine which choice of technology is more effective. Perhaps that way, the needs of the institution, the academics and the students can be identified and blended to produce a satisfying answer.

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The Higher Education Distance Learner and Technology

Terry Geddes
Research and Development
Open Learning Institute
Charles Sturt University - Mitchell

This paper was presented at the ASPESA 11th Biennial Forum on Distance Education Futures, held in Adelaide 21-23 July 1993. It outlines a cautionary and critical framework for adoption of new technologies in distance education.

INTRODUCTION

This paper is written with distance learners in higher education in mind.

The development of new communications technology has placed pressure on distance educators to use this technology. The implications of the assertions behind this pressure are that distance educators are luddites and that this technology provides a ready-made solution to a shortage of places in higher education and is manna from heaven for open learning initiatives.

To relate technology to open learning in this way represents a misunderstanding of open learning. Open learning is not an instructional/learning system but a set of conditions and structures which make a particular learning system more accessible and flexible for the student. It is the mode of learning which is important when considering the means by which messages will pass between instructor and learner. Some technologies, used in a certain way, may close rather than open a system.

At the ASET Conference in Adelaide in 1992, Di Bolton (1992) suggested three criteria to determine the appropriate choice of technology for use in distance education. These criteria are (briefly) that the technology should be appropriate to the learning situation, that it should be universally available and that it should be established in the community (ie support is available in the community).

When these criteria are used to assess a range of communications technology the resultant choices are restricted. Interestingly, they correspond very closely to the list of technologies that Tkal (1992, p.44) placed under the heading 'Access (user centred)'.

OPEN LEARNING AND DISTANCE EDUCATION

Open learning is not an instructional/learning system but a set of conditions and structures which make a particular learning system more accessible and flexible for the student. Open learning can be seen as an umbrella under which a variety of learning modes have some or all of the characteristics of open learning (Rumble, 1989). Learning modes fall on a continuum ranging from purely contiguous to purely distance.

In a purely contiguous system instructor and learner are together in time and place whereas they are separated in time and space in a purely distance mode. Most learning systems fall between these ends of the continuum and are truly mixed mode systems.

The two keys concepts of open learning are accessibility and flexibility and a learning system at any point on the continuum can have some or all of these features. For example, many adults choose to study in higher education by distance education because of the flexibility available for study but there is unlikely to be open accessibility. Entry will probably be restricted by a number of criteria. This system then has some features which render it open and some which close it.

One other misunderstanding related to the concept 'open learning' is the often implied assertion that modern communications technologies are obvious highways to open learning.

Consider the following:

> However, the most distinctive characteristic of Open Learning is its extensive use of television, radio and computer assisted learning technologies. (OLAA 1993)

No technology, per se, necessarily renders a system open; that depends on how a technology is used. For example, broadcast radio or television may close a system because students are committed to listening and/or viewing at a set (inflexible) time. (Given appropriate equipment they could record off-air; but the cost of this equipment may deny some students access to this more flexible possibility.)

Consider the following:

It is the learning mode of the student that is important when considering choices of technology. Consider complex technologies which often require expensive hardware. The cost of this equipment may be beyond the means of individual students and so a greater range of technology may be available to on-campus students (where the institution provides the equipment) as compared to off-campus students.

The off-campus student is the distance learner and so we need to ask: what is the learning environment of the distance learner and how does this affect the choice of educational technology?

THE DISTANCE LEARNER

In the context of higher education the distance learner is an adult who is typically in employment and is seeking a qualification to enhance career prospects. The distance learner has usually chosen this mode of study because of a degree of immobility which makes on-campus study inaccessible and/or because this mode of study allows much greater flexibility in study routines. This flexibility is important because adult distance learners are usually juggling a number of commitments in the limited time available.

In general, distance learners study on their own, in isolation from other learners. They may participate in formal or informal learning groups from time to time but these activities occupy a small amount of the total time spent on learning. Typically, distance learners study at home and any technology used to deliver messages to these students must be able to deliver messages to the individual student's place of learning. This point is important. It is true that many distance learners live in cities and could attend a site, if necessary, to access a particular delivery system (eg video conferencing) but a proportion also live in relative isolation from other learners and such facilities would be costly to provide and attend. Also, the city dwellers are very likely enrolled in a course which could be taken on a part-time on-campus basis at a city institution but they have chosen the distance mode for the reasons given above.

Therefore the choice of a technology which results in delivery only to a group negates the students' desire to avoid the inflexibilities associated with group instruction.

While these are the general characteristic of this group of distance learners it must be acknowledged that there will be important individual differences in the approaches to learning within the group.

COMMUNICATIONS, MEDIA AND TECHNOLOGY

The world is experiencing rapid developments in communications, the process by which messages pass from the sender of a message to the receiver of it.

A message passes from sender to receiver via a medium - an intermediate carrier capable of transmitting a message. A medium may embody a technology. Technology is knowledge relating to a particular process. Technology, also, in many cases, is embodied in particular hardware and this hardware is necessary if one wishes to communicate via the associated medium.

The existence of hardware does not imply that communications will necessarily be easy using that hardware. Users have to learn to use hardware items. Some are relatively easy to use such as switching on and tuning a radio but others are more complex such as using a personal computer.

Some technologies require special equipment to place messages on a medium. Two examples of this in modern communications technology are the CD ROM and the laser disk. Such special equipment requirements often elevate the cost of using a particular technology. Also, some types of modern multi-media technologies require detailed planning, the integration of information from a number of different sources and just the right equipment to handle this integration task which yields a final single package. These technologies often have a very high ratio between development time and ultimate learning time. Rowntree (1992, p.102) gives the following figures:

Table 1

Medium	Time to produce one hour's worth of learning	Barclay's estimate
lecturing	2-10	
small group teaching	1-10	
teaching by telephone	2-10	
video-tape lectures	3-10	
audio-vision	10-20	100
text	50-100	
broadcast television	100+	
computer aided learning	200	450
interactive video	300+	1400

* *From Rowntree P103 and derived from Barclay's Bank*

The arrival of these new and often versatile communications technologies gives rise to an expectation that they should be used as soon as possible and expectation that since education is very much a process of communication these technologies must be just right for it. These views tend to ignore the considerations discussed above. Hardware does not come with inbuilt messages. Messages tend to be unique to the needs of sender and receiver(s) and each message or collection of messages may constitute a new package. The development of these packages is often complex and relatively expensive. Higher education is mainly concerned with complex rather than simple issues. Users of a new technology have to learn how to use it. These factors frequently mean that the uptake rate for new technology is slow. Consider, for example, the relatively slow penetration into education of technologies such as computer assisted learning, CD ROM and laser disks.

CRITERIA FOR SELECTING TECHNOLOGY FOR USE IN DISTANCE EDUCATION

At the ASET Conference in Adelaide in 1992, Bolton (1992) suggested three criteria for judging the selection of communications technology in distance education. The first relates to the choice of a technology in any teaching/learning situation and the other two relate specifically to distance education. They are derived from Bolton (1993).

These criteria are that a technology should be:

- appropriate to the content and/or skills to be learnt
- universally available to students
- established in a community, ie that support is available in the community to assist users.

Technology should be appropriate to content and/or skills to be learnt

This is an axiom for the choice of any educational technology. Each technology has a set of characteristics which render it more suitable for some uses than others. The strengths of a technology should be matched to learning tasks which can benefit from these strengths. For example, the study of art may require that the learner be able to see actual works or accurate visual representations of them. These visual images might be conveyed to the learner in a number of ways such as photographs, plates in a book, by film, by slides, by laser disk. A stylised graphical representation may not be acceptable. It is visual but it will not capture the qualities of, say, an original painting. A textual description of a work, however detailed, may not capture the totality of an original work. On the other hand, a text may assist the learner's observation of and reflections on a work.

In a systematic approach to the development of a learning package one step will involve the identification of appropriate media but this step will come after the identification of the characteristics of the learners and after an analysis of the learning tasks to be undertaken.

The redundancy argument does provide a basis for delivery of much the same messages by a number of media (technologies). It is readily acknowledged that different learners have different learning skills and have varying degrees of competency in learning from various media. It follows then that a way to cater for the needs of a disparate group of learners is to deliver the essential messages in a number of different ways, eg using print, audio and visuals. That is, to offer the learner a number of messages some of which may be redundant.

Rowntree (1992 p.104) refers to

> one Open University economics lecturer who made a point of saying what he wanted to say in his printed workbook, then saying it again with sound on radio and then saying it again, with pictures, on television.

The technology should be universally available

Earlier it has been argued that the distance learner chooses this mode of study because of relative isolation from an educational institution and/or because of the flexibility in relation to time that this mode provides. Further, it is reasonable to assume that all students enrolled in a subject in a particular mode will have equal access to all methods of delivery available in that mode. It would be inequitable for some students to be able to access more alternatives that other students in the same course.

These considerations give rise to the criterion that a technology to be used in distance education should be universally available so that each student can access that technology in their normal place of study or else can very conveniently access the technology in another place. For example, there are distance students who use commuter travel time of up to three hours a day, usually by train, as their principal study time. Television would not be available on a train but since television transmission is available to more or less all Australian homes the choice of television would not violate this universality principle because it would be reasonable to assume that students who study mostly on trains could readily access television at home, provided that the student can afford recording equipment. (In fact, given the ephemeral quality of broadcast television, any student using television should have a VCR so that the program can be accessed more than once.)

Cost of access to a technology is a further consideration in relation to universality. Student access to a technology is likely to be limited by excessive cost. The widely affordable technologies based on the general penetration of each in Australia at large include the telephone, radio, television, audio tape and video tape. Computers are still falling in cost. Relatively powerful complete microcomputer systems can now be purchased for less than $1500 plus an additional $300 to $600 for a printer. Even so, not all students would find this affordable. Nevertheless, there are subjects taught at a distance which require that students have access to a particular type of computer. For some students this requirement will be met by use of a computer at work.

The discussion so far has looked at this universally available criterion in relation to teaching specific subjects. The principle might be relaxed in relation to non-subject matters. For example, on-line access to the library catalogue might be made available to any student with the necessary equipment, ie. a microcomputer and a modem. Similarly, electronic mail (EMAIL) could be made available. In the case of EMAIL alternatives would be available and include the telephone, voicemail, facsimile and post.

Community support is available

Given that the majority of distance students live remote from the institution with which they studying then the fact that use of a particular technology is well established in a community may be important for student use of that technology. The student may be unable to always obtain appropriate assistance from the institution. With computers, for example, institutional help may extend to help with software used in a particular subject but it unlikely to extend to hardware. For this the student will need to turn to the community for assistance. In the case of computers, this is an argument for buying a computer close to where you live especially if you are an inexperienced computer user.

TECHNOLOGY AND THE DISTANCE LEARNER

It is not proposed here to detail the features and advantages and disadvantages of various technologies as they relate to education and especially to distance education. . An excellent report covering these matters is Tkal (1992).

The following table presents an assessment of a list of technologies taken from Tkal against the second and third criteria discussed above. In relation to the first criterion it can observed that each of the technologies listed can have an appropriate use in education but actual use will be specific to particular learning situations.

Table 2

Technology	Universally available?	Community support?
Print	Yes	
Facsimile	Not yet. Costs are falling. Uses existing phone lines	Would flow from purchase of hardware
Computer mediated communications		
EMAIL	Not yet. Computers and modems not ubiquitous	
Bulletin boards	as above	
Computer conferencing	as above	
Audio		
Audioconferencing	Yes. Uses telephone	Yes
Voicemail	Yes. Uses telephone.	Yes
Radio	Yes. Free to air. Receivers ubiquitous. Range may be limited	Yes
Audiographics	No. Requires special and relatively expensive equipment	
Computer assisted instruction (CAI)		
Computer based training	Requires stand alone PC	Yes for the PC. Probably not for software.
Computer managed learning	As above	
Multi-media CAI		
Hypermedia	As above and to use developed packages may require training	
Optical disk	No	
CD ROM	Not yet. Requires special equipment. Costs falling.	
CD Interactive	No. Requires special and expensive hardware.	
Digital video interactive	No. Requires special and expensive hardware.	
Television	Yes. Ideally student will own VCR.	Yes
Videoconferencing	No. Specially equipped studios required	

TECHNOLOGY USED IN DISTANCE EDUCATION AT CSU-MITCHELL

In 1992, in order to gain an insight into the use of various communications technologies in distance teaching a questionnaire was sent to all academic staff on the Mitchell Campus (N=190). 47 questionnaires were returned and the responses are summarised in Table 3. A response rate cannot be estimated because an unknown number of all the people surveyed were not teaching at a distance.

Table 3

Technology	Number using this technology	Number who would like to explore this technology
Print	45	0
Facsimile	18	1
Email	2	12
ASPEN Voice mail	4	2
Audio cassette	10	2
Audio teleconferencing	17	3
Computer bulletin boards	1	10
Computer conferencing	1	8
Audiographics	0	9
Computer assisted learning	4	13
Computer managed learning	1	10
Commercial software	12	6
Hypercard/hypermedia	1	7
CD ROM	3	6
Video disk	0	2
Radio	0	7
Television	1	5
Video cassette	7	8
Videoconferencing	0	5

Some possible reasons for these results

1. If a wider range of technologies is to be used to deliver distance education then substantial resources in the forms of human resources, training, hardware, software and production facilities will need to be available.

   A wide penetration of new forms of technology into distance teaching will only occur if staff seeking to use these technologies are provided with substantial assistance. This assistance relates particularly to training, development and production. In Table 3 the types of technology for which the highest number of respondents sought more information were the least used technologies. Also the ratios between development time and the amount of teaching time which results given by Rowntree in Table 1 and the skills required to develop learning materials by these techniques mean that if individuals are left to work alone little development will occur and no widespread use will result. (See, for example, Finklestein 1992)

   Print is the most used medium in distance education at CSU and in this context is worth observing the substantial resources which are available to support delivery in print. Without such support both the volume and quality of printed materials would decline. This support includes instructional design, text processing, graphic design, editorial assistance and printing. No comparable assistance is available to any other technology with one exception.

   The high use of audioteleconferencing on the Mitchell Campus of CSU stems from the level of support which is available. The services of booking conferences, contacting students, mailing agendas, liaising as necessary with participants up to the time of the conference and the provision of technical assistance during the conference are all provided. The 'teacher' is left with only the instructional aspects of the conference to consider.

2. During the period in which innovations have been occurring in communications technologies academics have experienced increases in workloads. This trend will make the provision of assistance for the development of learning materials using these technologies even more important.

3. A further factor inhibiting change may be the lack of rewards for innovative teaching. In higher education innovative teaching practices do not generally attract widely available rewards.

4. Lastly, there is the question of the nature and purpose of higher education and the inclusion of these considerations in any discussions relating to the choice of delivery modes in distance education. Two authors who have discussed the nature of learning and considered how this might influence the choice of media are Larsen (1986) and Holmberg (1990).

GENERAL CONCLUSIONS

In conclusion I draw attention to the following from Tkal (1992 pp.1,2):

> While investigating educational technologies and their applications, the following issues repeatedly appeared as important in the use of educational technology for open learning and distance education:
>
> No technology can be singled out as intrinsically superior to all others or able to service all needs;
>
> Technology cannot be considered in isolation. It must be suited to the learning context, the learners' level of motivation and the level of the learning activity;
>
> Technology can serve three functions at various stages of learning; - to motivate and inform - to guide and support - to facilitate self-study and independent enquiry;
>
> Any implementation of technology requires careful planning and proper evaluation.

Those who are advocating a rush to the use of these new technologies in distance education would do well to take notice of Tkal and the others who have written similar things but who are often ignored by single minded advocates. And, of those people involved in the delivery of education at a distance who cherish the notion of being considered at the cutting edge of technology while simultaneously rejecting the universality argument postulated earlier, we might ask: 'and whose ego is being satisfied here'?

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Internet Relay Chat (IRC) - A Real-Time Multi-User Computer Collaborative Learning Medium

Simpson Poon
Faculty of Science and Agriculture
Charles Sturt University-Riverina

This paper was presented at the ASPESA 11th Biennial Forum on Distance Education Futures, held in Adelaide, 21-23 July 1993. Network teaching will be an important development area for distance education and this paper outlines the benefits of Internet Relay Chat.

INTRODUCTION

Although distance education offers a flexible and independent learning environment, some students may find that they have to trade off interaction for independence. Increasingly, information technology has been used in distance education to enhance interaction between students and teachers as well as among students themselves. As telecommunication links can transfer data faster and be able to handle multiple communication traffic simultaneously, interactive multi-parties conferencing becomes viable. Computer Mediated Conferencing (CMC) has emerged as a viable method to support distance education because it is low-cost and readily accessible. Internet Relay Chat (IRC) provides a flexible and accessible means of communication among distance learning students.

Internet Relay Chat (IRC) is a real-time multi-users computer mediated conferencing system. The advantages of IRC over other group communication technologies are:

- *Wide Area Coverage* - IRC can use Internet, a major worldwide network, as its communication media, the IRC scope of coverage will be the boundary of Internet.
- *Low Cost Communication* - Although Internet is an multi-million dollars network funded by a large number of organisations from many nations, using IRC does not involve any extra cost compared to sending electronic mails.
- *A Real-time Multi-User System* - Conferencing is carried out in real-time and with multiple users, this is different from the 'post and read' bulletin board systems (BBS).

This paper describes a framework of using IRC and other services on Internet to improve information acquisition and exchange among distance learning students and teaching staff; how IRC provides impetus for the globalization of distance education is also discussed.

WHAT IS INTERNET RELAY CHAT (IRC)

Internet Relay Chat (IRC) is a multi-users, multi-channels real-time conferencing system. Jarkko Oikarinen wrote the original code for IRC in 1988 (Pioch, 1993). IRC is designed to be set up using client-server configurations. It uses a communication protocol which is independent of operating platforms.

Since IRC systems reside on Internet, the scope of coverage of IRC is the boundary of Internet. Being a real-time system, users of IRC receive messages transmitted over the network instantaneously. This is important to maintain the dynamic of any conferencing sessions.

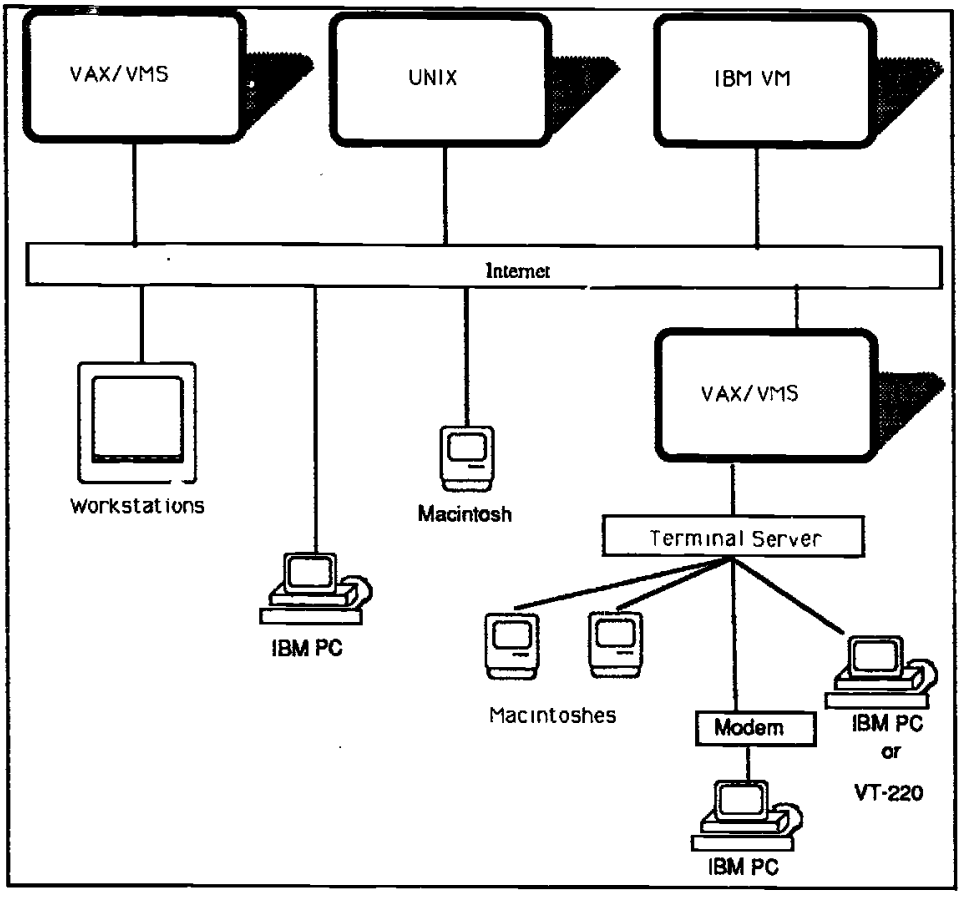

Fig 1. Systems Architecture for Network Set Up

In an IRC environment there is a number of 'channels'. Channels can be considered as sub-environments where discussions are carried out, or can be viewed as virtual tutorials. Each channel has a topic and can be changed by participants in the channel. In contrast to physical 'rooms', all users logging onto IRC can join in one or more channels if they have the appropriate access rights. Access rights are assigned by the channel operators who are supervisors of their channel(s).

Channels can be 'public' or 'private' in nature, by default all channels are public. Public channels allow everybody involved in the current discussion to receive and respond to other participants. Private and Secret channels allow participants to engage in private discussion which is transparent to other people in the same channel or in other channels. Discussions held before one joins a channel are not available and will not be recalled.

A FRAMEWORK FOR REAL-TIME COLLABORATIVE LEARNING

Computer conferencing as a distance learning medium is productive and can be better than its paper-based counter-part (Morrison & Lauzon, 1992). Students can not only benefit greatly from interactive discussions but also find it rewarding (Latham, et.al., 1990). This is because computer conferencing can offer immediate and timely information exchanges, as well as flexible learning hours (Azarmsa, 1987).

It is important to emphasize that IRC is neither a substitute for the traditional ways of conducting distance education, nor a perfect cure to the remoteness problem in distance learning. IRC is intended to make distance education more successful by fully utilising the potential of global public access networks.

To be a useable distance collaborative learning environment, IRC must not be bound by constraints such as cost, flexibility, useability, accessibility and scope of coverage.

Because of the client-server set up, IRC participants do not need to have 'log on' privileges on the remote server. A client program will perform the message handling process which is transparent to the user. Both IRC clients and servers are available on many common operating system platforms (UNIX, VMS, MS-DOS, MacOS and IBM-VM). Clients and servers installed on different platforms can communicate with each other. Most existing IRC clients and servers are either public domain software or shareware with nominal costs. Most clients and server programs come with source-codes for customization purposes.

For users who cannot directly connect to Internet, they can either use modem dial-up to a nearest Internet node which has a client installed or directly to a server. Since servers can be linked to form a homogenous environment, users can log on to the one nearest to them.

Apart from real-time interactive communication, users can also send and receive files within IRC. This is essential if users want to hold discussion and exchange written work at the same time. This file transfer function is part of IRC and therefore users can send and receive files without leaving the IRC environment.

Once IRC has been set up, little maintenance is needed to ensure its day to day operation. Users can participate in IRC any time of a day. This is essential if users are from different time regions. The advantage of this setup is that users can carry out discussions even without the presence of facilitators 24-hours a day.

GLOBALIZATION INTER-VARSITY CURRICULUM IN DISTANCE EDUCATION

Gloabalization is now a key issue in distance education. Many institutions are now offering their curriculum both locally and overseas . The creation of TV OLI is an indication of such perspective. Although television broadcasting is a proven method to conduct distance education, it does not allow multi-party interaction in real-time except in the form of video-conferencing. IRC provides a supplement to this shortcoming.

IRC is available at low cost and can also help to ease resource- constraint problems in conducting distance education. For example, the School of Information Studies in Charles Sturt University-Riverina (CSU-R) organises courses to be taught overseas. Some of these courses are jointly organised by CSU-R staff and staff at overseas institutions. Many teaching activities during the semester can only be carried out by making telephone calls and travelling overseas. These exercises put stresses on both financial and personnel resources. As an alternative, IRC can be used to set up tutorial

and discussion forums. Overseas students may either connect to a server in CSU-R via a client on their campus, or by logging onto the CSU-R server directly via Internet. Figure 2 indicates how such arrangements can be implemented using IRC.

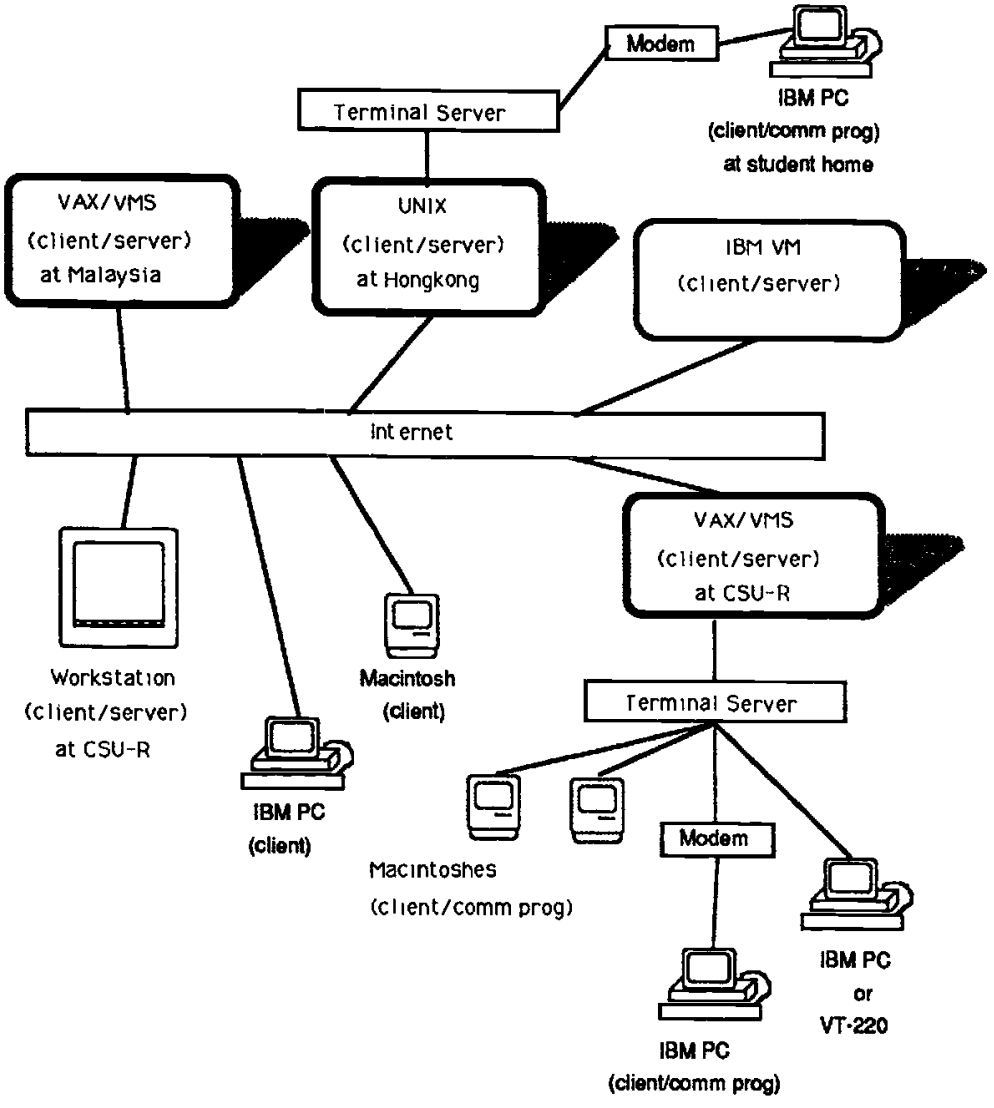

Fig 2. A Framework of using IRC as trans-national discussion forums

```
#amiga cache H spoon@golum.riv.csu.edu.au (!id sp)

#amiga Rochus H srb103@PASCAL.UNI-MUENSTER.DE (Rochus Wessels)

#amiga FlyGuyD H tucker@splat.aarnet.EDU.AU (David Tucker)

#amiga StarW H g93h7334@hiPPo.ru.ac.za (!id StarWriter)

#amiga HRT H@ BASSAL@eldel.epfl.ch (<Real)

#amiga ALFred H@ benbachi@disun45.epfl.ch (DoC PSI Of ZeNiTh)

#amiga DannyBoy H s2939781@ie.technion.ac.il (Danny mendel)

#amiga Darynn H zio@netcom4.netcom.com (NSDC001.W1.A The
original and +best.)

#amiga piki H ircserv@tulip.kaist.ac.kr (HITEL ID - a08h04s9)
```

Fig 3. A list showing users from different part of the world.

Apart from IRC, there are other information services available on Internet which are valuable to distance learning students. These services provide important directory services for their users.

Online Library Catalogues

Adequate library access is important for all university studies. Distance learning students may not always enjoy library access at the institutions they study. Therefore, it is essential for them to obtain reference materials from library resources accessible to them. By using online library catalogues, students can reduce the amount of time spent on locating reference materials. Some online catalogues allow access to overseas libraries as well as the local library (eg. the ANU Gopher server). These would not be easily realised without a well-formed global network like Internet.

Miscellaneous Information Services on Internet

Besides online library catalogues, there are also publicly accessible information services offered by many institutions on various research areas. Some examples are Wide Area Information Services (WAIS), Gopher, and World Wide Web (WWW). These services provide access to a wide range of databases, collections of research papers, as well as answers to frequently asked questions on many topic areas.

IMPACTS OF IRC ON DISTANCE EDUCATION

Although IRC helps break down the location barriers of communication in distance learning, it creates issues which are non-existent compared to its paper-based counterpart.

Security

With IRC, users may gain access to areas in a network where data and important information are stored. Security issues inherited from using IRC are different from using telephone or video conferencing. It is essential to ensure security policies and control plans in public access networks are properly implemented. In any IRC

environment, an activity log must be kept to monitor illegal activities. If servers are linked within a network, then security plans must also consider the progressive effects of any breaches of security.

Code of Behaviours on IRC

Although users are not communicating with each other in a physical sense in an IRC session, it must be emphasized that all users are real people. Consequently, the standard of behaviours expected will be very similar to any interpersonal communication (Picoh, 1993). A Code of Behaviours for using IRC must be made known to all users. Such Code of Behaviours should give guidelines of acceptable behaviours as well as the consequences of harassing others.

CONCLUSION

As a real-time multi-user collaborative learning environment, IRC is a flexible and yet lost-cost option. The fact that IRC resides on Internet means there is no location boundary apart from the scope of Internet. IRC can help to accelerate the globalization of distance education. Together with other technological based teaching techniques, IRC will help release financial and personnel constraints when distance education means teaching in another country thousands of kilometres away. Also, IRC creates opportunities to enhance collaborative efforts in both trans-national education programs as well as distributed campuses teaching (Ljosa, 1991).

IRC is designed to be platform independent. Users can choose to use IRC on their favourite operating platforms. In contrast to many computer based group conferencing technologies, the additional costs needed to set up IRC are minimal. When combined with other information services on Internet, network teaching will be an important development area for distance education.

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The Voice Mail Trial in Distance Education Courses at Charles Sturt University

Peter Donnan
Instructional Designer
Open Learning Institute
Charles Sturt University-Riverina

This paper was presented at the ASPESA 11th Biennial Forum on Distance Education Futures, held in Adelaide 21-23 July 1993. The paper presents an evaluation of voice mail technology in distance education courses after a two year trial period at Charles Sturt University.

INTRODUCTION

Voice mail is a product of modern technology which has been trialled for two years at Charles Sturt University with students in eleven distance education courses. The trial was part of a DEET 1991 National Priority Reserve Fund project designed to evaluate the use of voice mail as a means of improving communication between lecturers and distance education students, between university support staff and distance students, and between distance education students themselves. This paper identifies the benefits of voice mail for distance education students, lecturing and support staff involved in the trial; it briefly compares the effectiveness of voice mail with other communication methods such as direct phone, FAX, letters and personal visits; it assesses the value of voice mail for Charles Sturt University as an institution; and it seeks to disseminate the results of the voice mail trial for the benefit of other distance education providers.

The paper outlines some of the difficulties encountered during the early phase of the trials and focusses on voice mail training. The paper concludes that although in telepedagogical terms voice mail does not offer the synchronous communication and interaction possible with teleconferencing or direct phone contact it is, nevertheless, a communication technology well attuned to the contemporary needs and realities of distance education and it offers substantial advantages within its limitations.

BACKGROUND TO THE TRIAL

The Voice Mail System - Draft Discussion Paper and Proposal, prepared by the Charles Sturt University - Riverina Systems Officer, Ian Davidson in April, 1990, clearly identifies the issues which the subsequent trial sought to address. Davidson (1990: 2) described communication difficulties frequently experienced by lecturing

staff and distance education students in many dual mode institutions. Lecturers, with teaching, preparation, marking, research and other commitments, are often either not present in their offices to answer phone calls or find that phone calls interrupt important work resulting in productivity losses. Distance students, on the other hand, frequently need to make repeated calls to contact their lecturers, and if they are working during the day and also incurring the expenses of STD calls, they find the process inconvenient, costly and frustrating.

In providing an integrated, efficient solution to these problems the *Draft Discussion Paper* recommended that an evaluation of voice mail be conducted. Voice mail, a relatively new computer based technology, combining the best features of regular answering machines, electronic mail and modern PABX systems, only requires access to a tone dialling telephone.

The main alternative to voice mail was electronic mail and this technology had already been successfully used in a number of Charles Sturt University courses (Frost, 1990). Electronic mail requires computer skills and equipment to which many distance education students, particularly in the non-science areas, either did not have access or felt uncomfortable with the technology. Fitzgerald (1990: 58) argued that voice mail would be more readily accepted by general telephone users than electronic mail simply because people are more psychologically attuned to speaking rather than typing complete sentences correctly.

A committee was established and a voice mail system was acquired from AAP Reuters on a trial basis to examine its potential in distance teaching and learning.

AIMS OF THE TRIAL

In July 1990 Charles Sturt University was successful in obtaining a National Priority Reserve Fund (DEET) grant. Smith (1990: 1) outlined the project in these terms:

> "Voice mail is a relatively new yet very simple technology that has the potential to dramatically improve the timely communication between a lecturer and distance student. It is proposed to evaluate voice mail with a range of courses offered in the distance mode."

In general terms the purpose of the two year trial was to evaluate the use of voice mail as a means of improving communication between lecturer and distance students, between university support staff and distance students themselves. More specific objectives of the trial encompassed:

- identifying the benefits of voice mail for distance students, lecturing and support staff involved in the trial;
- establishing the effectiveness of voice mail in comparison with communication methods such as direct phone, Fax, letters and personal visits;
- assessing the value of voice mail for Charles Sturt University as an institution; and
- disseminating the results of the trial to other distance education providers.

Voice mail is the transmission of a voice message to a receiver's mailbox. The trial utilised the Telecom public network and the ASPEN (Automatic Speech Exchange Network) voice message system. Although Aspen is based on a computerised system it digitises and records messages with high fidelity.

Staff and students authorised to use the system are allocated mail boxes which consist of a portion of private, password protected disc space on the Octel system located at Charles Sturt University. Those allocated mail boxes on the group distribution list are able to send messages, as well as retrieve them from other users, and it is possible to do this from any tone dialling phone in the world that is compatible with the Australian telephone network.

Other voice mail system features identified by Davidson (1990: 3) are the ability to:

- record and send messages to individuals or the whole group with ease and speed;
- request receipt acknowledgment of the message;
- mark messages 'private' so they cannot be forwarded to others;
- reply to messages without having to generate a call to the sender directly;
- forward a message to another subscriber, optionally after adding comments to the message;
- save messages for future reference or delete them;
- review and edit messages before sending them;
- record a personalised greeting in lieu of the standard system greeting;
- rewind, skip, forward and adjust volume during the review of messages;
- use the system twenty-four hours a day; and
- recognise a message is available for review by a periodic 'ting' which occurs every 20 minutes (this was only available on handsets connected to the CSU PABX).

PROGRESS OF THE TRIAL

This section outlines various issues and concerns associated with different stages of the trial that will be of interest to other institutions exploring voice mail. The following table summarises relevant details of student groups involved in the trial.

Group No	Student Trial Group	Date advice sent to students	Number of students in original groups	Courses involved	Year level (in 1992)	Year level when first put on Aspen
1	Horticultural Biology 1	Wk 4 Spr. 90	35	Ass. Dip. Am. Horticulture	N/A	1st
2	Human Resource Management	10.2.92	49	M. of Bus. (HRM), Grad. Cert. in Bus. (UBQ), Grad Cert. (ATO)	1st	1st
3	Human Resource Management	Feb 91	37	M. of Bus. (HRM)	2nd	1st
4	Industrial Relations	4.9.92	15	Grad. Cert. in Bus. (INR)	1st	1st
5	Industrial Relations	31.7.91	29	Grad. Cert. in Bus. (INR) Grad. Dip. in Bus. (INR)	2nd	1st
6	Bachelor of Social Work	2.3.92	43	B. Soc. Work	1st	1st
7	Bachelor of Social Work	31.7.91	32	B. Soc. Work	2nd	1st
8	Medical Laboratory Science	19.3.92	53	B. App. Sc. (Med. Lab. Sc.) Ass. Dip. App. Sc. (M. Lab. Sc.)	Various	

The trial period has concluded, but students in groups 2 to 7 of Table 1 continue to have access to voice mail during 1993.

The First Group

The first group consisted of students enrolled in Horticultural Biology but their exposure to voice mail was limited to approximately 12 weeks due to delays in setting up the trial. This was a prototype trial and two issues identified in the evaluation report (Roberts, 1990) are particularly worthy of comment.

Where there are well designed distance education packages supported by residential schools the need for interaction from a student's viewpoint may not be a high priority, especially in faculties such as Science and Agriculture; the reverse may apply in different disciplines, especially in Humanities and Social Sciences. The selection of subsequent trial groups reflected this consideration. The second issue was related to early difficulties encountered and this will be discussed in the following section.

One of the early difficulties was that some students did not have access to tone dialling phones. Solutions consisted of four options: students could contact Telecom and arrange a free replacement handset for the duration of the trial; they could replace their old phone with a Telecom Touchphone at a cost of $20; they could purchase a tone dialling phone from a commercial outlet; or they could obtain a small tone dialler from Charles Sturt University to place over their mouthpiece, paying $13.00 and collecting $9.00 upon its return. This was not a major problem and it was only necessary for Charles Sturt University to purchase fifty tone diallers.

Students in Human Resource Management attending course based residential schools received voice mail training, including a hands-on demonstration and the opportunity to view a fifteen minute Octel (1988) video, 'Introduction to Voice Processing'. In these introductory sessions the benefits of voice mail were personally presented; finer points such as editing messages and cutting short Aspen menus were demonstrated; and the potential for using Aspen in facilitating study groups and contacting other Charles Sturt University services such as the library were suggested.

Students who did not attend residential schools received an introductory letter from the course coordinator as well as printed instructions (Smith, Buete, 1991) on using Aspen. An irregular newsletter for Charles Sturt University by Davidson (1990) was also published and it informed readers how to get the most from Charles Sturt University's Aspen Voice Messaging system.

The Use of Voice Mail By Course Co-ordinators

The Medical Laboratory Science trial groups were installed on Aspen in Autumn 1992 but they were not offered access in 1993. The purpose of this trial was to assess the value of voice mail when it was used by course coordinators to generally assist distance students in the early phase of their studies when attrition rates are high. The coordinators provided information about course structure, residential schools, assignments, exams and they also responded to individual enquiries.

In the questionnaires students indicated their appreciation of this but as they progressed in their studies a recurring comment was that "all staff involved in teaching subjects in this course should be on voice mail." This trial group also had the highest number of uninitialised mail boxes.

EVALUATION OF STUDENT USE OF VOICE MAIL

The evaluation in this section is based on an interpretation of one hundred and twenty seven questionnaires completed by students during the course of the trial. Monthly Individual Subscriber Usage Statistics, available on computer printouts and more recently on disk, provided additional data. In this area of telepedagogy, however, Potter's (1983: 95) view is that "interaction between student and tutor varies considerably according to need and inclination rather than being governed by any set of directives or guidelines."

DISTANCE STUDENTS' APPLICATIONS OF VOICE MAIL

TELEPHONE ANSWERING

- while at work
- when on the phone
- when interruptions aren't welcome
- so that the family can always get through

VOICE MESSAGING

- To send a message to course/ subject coordinator:
  - Textbooks
  - Course structure
  - Academic content
  - Assignments
  - Exams
  - Mail Packages
  - Arrange visit
- To send a message to other Charles Sturt University services:
  - Distance Student Liaison Officer
  - Library
  - Accommodation
  - Accounts
- To send a message to other students
  - support/morale/motivation
  - discuss problems
  - discuss assignments, exams
  - residential schools
  - share resources
  - study groups

Student Responses to Questionnaires

1. The average number of voice mail calls to lecturers was *6*
2. The matters most frequently discussed with lecturers in order of priority were: *i) assignments ii) academic context iii) course structures iv) mail packages v) textbooks vi) exams*
3. The preferred ranking of communication methods for contacting lecturers was: *i) voice mail ii) direct phone iii) fax iv) letter v) visit*
4. The need to contact other students was regarded as *important.*
5. The two most important reasons for contacting other students were: *i) to discuss assignments ii) for support, morale and motivation.*
6. The average number of calls to other students was *in the range of 1 to 3*
7. *Only one third* of students used voice mail to contact other Charles Sturt University services, *mainly the library.*
8. Voice mail was recognised as having special value in *i) organising Practicums (Social Work students only) ii) being able to access and send messages at night when studying.*
9. The level of satisfaction with voice mail training was *high.*
10. Voice mail training that could be improved upon was *i) clearer explanation of message editing & reply functions before sending a message ii) more encouragement during the first two weeks of usage.*
11. The most appealing general features of voice mail were: *i) affordability with the 008 number ii) 24 hour access iii) convenience and ease of use.*
12. Its main limitations were perceived as: *i) can't replace the benefits of direct phone interaction ii) its value depends on the lecturer's usage of and commitment to the technology.*
13. Comments which best encapsulated positive student responses to voice mail were:
    - *'Please keep voice mail going. I'm sure it enables many isolated students to feel more in contact with the university.'*
    - *'I'm very happy with the opportunity to be involved in utilising this significant communication tool: it's a great link between myself & other students and I'm prepared to contribute to it myself.'*
    - *'One of the only helpful bits of high tech I have come across. It should be available to every student.'*
14. Students' estimates of savings were - timewise: *between 8 and 26 hours* - financially: *$50.00* for direct line charges throughouta teaching session

Commentary

Questionnaires were either mailed to students or completed during residential schools and 127 responses were obtained from 293 students. Tuovinen's (1991, revised 1992) student and staff evaluation questionnaires provided much of the theoretical underpinning for the evaluation process. Students generally indicated high levels of endorsement for voice mail technology and among the most appreciative were those who had previously studied in the distance mode without it.

After close monitoring of the early trials, students in 1991 were given access to a 008 number and were able to ring Aspen for the cost of a local call. The following items require specific comment:

Item 1: This figure is misleading because some students failed to initialise their boxes while others made 30 calls.

Item 3: In the optional comment section of the questionnaire some students indicated they clearly preferred direct phone contact with their lecturer but the reality was that they were often not available; this factor, combined with the 008 line, explains the priority given to voice mail.

Item 5: Inter-student contact was associated with the Social Work groups far more than any of the other courses. After residential schools and in the second year of study as friendships became more established this contact increased. Students were able to contact each other but were not given whole group access as the lecturers had. Five students requested this option but it was rejected in terms of expense and in a small number of cases there was very high usage by some students.

Item 7: Charles Sturt University distance student library loans are mainly organised through an answering machine, fax, direct personal visits or post. The trial groups had access to a library voice mail box but the average number of calls received per fortnight was five. The user-friendly dimension of Aspen combined with the 008 option represented distinct benefits but many students did not take full advantage of this.

The following extract has been taken from the September 1992 report on Individual Subscriber Usage Statistics. There is an equivalent print out for each mail box user on the system and it enables the Systems Manager to monitor its usage patterns. In this case the name and mail box number have been deleted for privacy reasons but this is an example of a keen user of voice mail.

Date: SEP 15 1992 Time: 12:52P

REPORTS
Individual Subscriber Usage Statistics

Student Name (deleted)
Mail Box Number (deleted)

Monthly Statistics

PERIOD	SEP	AUG
INCOMING CONNECT TIME		
Total Incoming Connect Time (minutes)	50	75
Port Group 1 (minutes)	50	75
Port Group 2 (minutes)	0	0
Port Group 3 (minutes)	0	0
Port Group 4 (minutes)	0	0
Total Incoming Connections	9	18
Avg Incoming Connect Time (minutes)	5.6	4.2
MESSAGE STORAGE		
Total Message Storage	10	75
Storage for New Messages	2	2
Storage for Archived Messages	8	73
Storage for Future Delivery Messages	0	0
MESSAGES RECORDED AND SENT		
Messages Recorded	10	75
Total length (minutes)	8	8
Avg length (minutes)	1.3	0.9
Messages sent	6	9
MESSAGES RECEIVED		
Total Messages Received	4	7
Total length (minutes)	4	8
Avg length (minutes)	1.0	1.1

LECTURERS' APPLICATION OF VOICE MAIL

TELEPHONE ANSWERING

- During lectures or while in meetings
- After hours, during semester breaks, when at home
- While on the telephone
- When interruptions aren't welcome

Note: *lecturers' phones on the Aspen system receive messages in two ways: first when a voice mail message is transferred from another mail box user to the recipient's mail box without the phone ringing; second, the lecturer can also answer calls in the normal way when present in the office but after fourteen call tones an answering service is activated. Lecturers can access messages in their mailbox from home and they can also divert normal calls to their mail box if they have visitors in their office and do not want to be disturbed by the ringing of the phone.*

VOICE MESSAGING

- To students:
  - textbooks
  - assignments - expectations, feedback on
  - schedules and deadlines
  - updates
  - advice about new sources, references
  - clarification of issues
- To respond to student enquiries
- To send a message to the whole group
- To address a desired group (eg. struggling with a section of work)
- To access other Charles Sturt University services and staff
- To use the system to present mini-tutorials
- To send weekly broadcasts on content areas

Staff Questionnaire Responses

Nineteen lecturers and nine support staff have been specifically involved in the voice mail trial but an examination of the Charles Sturt University Internal Communication Directory indicates that voice mail is now strongly established on the three campuses. Eleven staff questionnaires were processed but there were dramatic variations in staff usage of Aspen.

1. The number of times staff used voice mail to contact students ranged from *0 to 150 (twice) with 30 to 40 calls being common over a session.*

2. The ranking of communication methods staff used for contacting students was: *i) voice mail ii) direct phone iii) letter*

3. During each session members of staff used voice mail to contact other Charles Sturt University staff/services *more than eight times*

4. The most popular voice mail feature was the *capacity to send a message to the whole group, easily and effectively.*

5. Staff found *considerable savings* both in time and financially but it was difficult to quantify in most cases.

Commentary

Charles Sturt University staff clearly identified benefits of voice mail in distance teaching but the variation in comments only supports Potter's (1983: 106) conclusion that within a university telepedagogical approaches must recognise that each teacher has a distinctive style of teaching and that each student has a most comfortable way of learning. Most lecturers would accept the Octel claim (1990: 3) that in hearing the caller's tone as well as the message, they can understand the context as well as the content.

In relation to *Item 2*, direct phone contact was the preferred option but the reality was, as one respondent stated it: "most students have full time jobs, so telephone calls during office hours are difficult or impossible - students are often not there."

Another dimension of voice mail acknowledgment in *Item 4* was that it enabled immediate follow up of enquiries: "students are not chasing me and I'm not chasing them." Davidson (1990: 2) discussed the problem of 'playing telephone tag' which is common in large organisations today and this lecturer's comments indicate a clear solution to it.

Dancer (1992: 130) cited research into the effectiveness of telephone communications conducted by AT & T in America which found that 68% of all business calls are not completed on the first attempt; 55% of all calls are for the one-way transmission of information; 67% of all calls are considered less important than the work that they interrupt and 76% of all calls do not require an immediate response. In a distance teaching and learning context these percentages may change but some of the patterns are replicated and voice mail is well designed to address them.
A problem arising during the trial was the difficulty created by a student sending frequent messages of extraordinary length. This can create intolerable demands on staff. It is possible to use the skip function key but in this case the decision was made to delete the mail box from the system altogether.

Charles Sturt University support staff indicated clear benefits of voice mail. The Distance Education Liaison Officer was able to redirect students' nightline messages to the relevant staff the next day using Aspen. This saved considerable time and also provided lecturers with the exact message rather than a written summary. There are significant savings in time when students' messages are transmitted directly to the lecturers' mail box without being mediated by the school secretary.

CONCLUSION

Voice mail does not provide the synchronous communication and interaction of direct phone contact or teleconferencing; nevertheless, Charles Sturt University's experience has been that this technology is very well attuned to the context and realities of distance education, offering substantial benefits within its limitations.

The basic skills to use Aspen can be easily acquired if students are prepared to explore the menu options. In fact, the Octel Aspen Guide (1990: 13) states specifically:

> "The best way to learn how to use Aspen is to play with it (experiment). Nothing you can do can hurt Aspen. Send messages to yourself. Get into personal options and change them."

Voice mail usage by students generally tends to reflect patterns initiated and modelled by lecturing staff, especially when they are obviously enthusiastic about and committed to its use; but the quality of the study materials, the nature of the subject, the student's year in the course and other human variables prevent simple generalisations.

Davidson (1992) presented an overview in these terms:

> "We keep a record every month of use of the system by students and that's for our reporting to DEET and as a rule we find mixed results. Some students are heavy users, some students don't even get to initialise their mail boxes and I guess it's partly dependent on how well your academics are using the system and whether you need assistance in your subject. With some of the bigger courses there's a range of students, from those who need to contact their lecturers almost every week to those who wouldn't contact them once during a semester. So we have a full range of usage history."

Purches (1993: 27) identified many positive features of voice mail for the teaching staff in Social Work but her conclusion was that different communication strategies should not be perceived as competing but rather complementing each other. This view was also supported by a Canadian voice mail trial in distance education where Bernard and Naidu (1990: 299) recognised voice mail's value in significantly supplementing interpersonal communication.

At Charles Sturt University over 330 staff now have access to voice mail and its benefits for academic and support personnel are commonly accepted. The general conclusion of this trial is that voice mail introduces a significant and heightened quality of communication into distance teaching and learning but as Dancer (1992: 140) stated: "The successful implementation of voice mail is also strewn with people issues and, as such, demands individual rather than broad brush answers."

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The Modularisation of Microbiology - Prologue

Sue Davies
Open Learning Institute
Terry Harden, Lesley Ballantyne
Faculty of Science and Agriculture
Charles Sturt University-Riverina

This paper documents Charles Sturt University's ongoing experience with modularisation, describing the benefits, as well as the difficulties encountered at the implementation phase.

INTRODUCTION

The modularisation and rationalisation of the subjects BIO115 - *Microbiology*, from the School of Science and Technology and BIO121 - *Principles of Microbiology*, from the School of Agriculture has proved to be an exciting, rewarding, yet very challenging project that we feel will demonstrate the real benefits of modularisation.

It has been a project that began in a small way but has snowballed into an enormous undertaking, with many positive outcomes for students, lecturers and the University.

It has certainly not been without its share of problems but the net result should more than justify the implementation of modularisation principles to the subjects BIO115/121. The modularisation of two subjects across two schools for both Distance Education and Internal modes has not previously been attempted and this exercise in modularisation of these subjects may well be the flagship and model for the further modularisation of other subjects.

THE DESCRIPTION AND A HISTORY OF MICROBIOLOGY

Microbiology is a study of living organisms of microscopic size and includes bacteria, fungi, algae and viruses. The activities of these microorganisms are central to the concerns of society, both nationally and internationally, and impinge on our daily lives in many ways, eg diseases of humans, animals and plants, food production, environmental pollution, etc. At Charles Sturt University, the subjects *Microbiology* (School of Science and Technology) and *Principles of Microbiology* (School of Agriculture) provide an introduction to Microbiology for students currently enrolled in fifteen courses. Any one subject which attempts to satisfy the specialist requirements of each course would ideally be composed of several discrete modules. The concept of developing specialist modules within these subjects arose from the following:

1. the recent inclusion of the subject *Microbiology* in the Environmental Science and Equine Studies courses,

2. the growth in student enrolments in the Biotechnology course,

3. the inclusion of *Microbiology* in an elective sequence of both the Nursing course and in the proposed Food Science course.

A Microbiology subject was first offered by Riverina College of Advanced Education in 1973 in the Diploma of Applied Science. There was also a large element of Microbiology in a subject offered by the Wagga Agricultural College at this time. Following amalgamation of these two colleges in 1975, rationalisation of Microbiology teaching was attempted for a brief period (1977-1978) but was soon abandoned because of difficulties experienced.

In the School of Agriculture prior to 1989, five subjects each covered Microbiology for different courses. A modular approach (preceding OLI initiatives) was devised such that a single subject *Principles of Microbiology* addressed all areas of Microbiology needed by students enrolled in the courses offered by this School. This initial process of modularisation involved a common core of eight weeks followed by two specialist modules each of five weeks (one for Agriculture/Horticulture and the other to cater for the specialist needs of the Wine Industry).

In 1992, the rationalisation of biology subjects occurred at Faculty level and the modular approach to Microbiology was offered to the School of Science and Technology - this coincided with the emerging demands to produce specialist modules. See Table 1 for a detailed breakdown of the modules appropriate for each course.

As well as making the modules consistent and applicable to both schools and groups of students, a decision was made to further take this subject to its natural conclusion by also including internal students. This is a positive move towards open learning methods of instruction and also addresses the question of equity between students enrolled in both the distance education and internal modes.

Table 1 - Analysis of modules offered for the subjects, *Microbiology* and *Principles of Microbiology*

Subject Code	Core Module	Prac Module	Specialist Module	Courses	Number of Students Internal	Number of Students External
BIO 115	1	2	3	B App Sc (Analytical Chemistry)	23	10
BIO 115	1	2	3	B App Sc (Biotechnology)		
BIO 115	1	2	3	B App Sc (Environmental Analysis)		
BIO 115	1	2	3	B App Sc (Environmental Science)		
BIO 115	1	2	4	B App Sc (Medical Laboratory Science)	10	15
BIO 115	1	2	4	Assoc Dip Ass Sc (Medical Laboratory Science)		
BIO 115	1	2	4	B Hlth Sc (Nursing)		
BIO 115	1	2	Not defined	B A (Library and Info Science)		2
BIO 115	1	2	Not defined	B A		1
BIO 121	1	2	4	B App Sc (Equine Studies)	20	-
BIO 121	1	2	5	B App Sc (Wine Science)	21	53
BIO 121	1	2	5	Assoc Dip App Sc (Winegrowing)		
BIO 121	1	2	6	B App Sc (Agriculture)	63	51
BIO 121	1	2	6	Assoc Dip App Sc (Amenity Horticulture)		
BIO 121	1	2	Not defined	Associate Students		3
				TOTALS	137	135

THE STRUCTURE OF MICROBIOLOGY

The subject *Microbiology* consists of two core modules, Module 1 and Module 2, which all students will study.

Module 1 - General Microbiology, the core theory module, is studied for the first eight weeks and consists of a general introduction to microbiology. It provides the basis for the specialist modules. The specialist modules cannot be attempted without first completing Module 1;

Module 2 - the Practical Manual, the core practical module, consists of practical experiments. Students do not do all the experiments in the manual, completing only those which are appropriate to their course pattern;

Modules 3 - 6 - the specialist modules, students then study the appropriate module for their course:

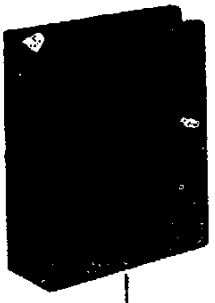
- *Module 3, Environmental/Industrial Microbiology*, for students enrolled in Biotechnology/Environmental Analysis/Analytical Chemistry/Environmental Science
- *Module 4, Medical Microbiology*, for students enrolled in Medical Laboratory Science/Equine Science/Nursing
- *Module 5, Wine Microbiology*, for students enrolled in Wine Science/Wine Growing
- *Module 6, Agricultural Microbiology*, for students enrolled in Agriculture/Amenity Horticulture.

For a pictorial analysis of this information, see Figure 1 which is derived from the Subject Outline for this subject.

Videotape

An exciting and innovative inclusion has been the production of a videotape which provides an introduction to techniques in the use of the microscope, and other areas important in the microbiology laboratory. It will be instrumental in giving this subject consistency between distance education and internal students, and also across the wide diversity of students that this subject encompasses.

Flow Chart of Modules to be studied in the subjects BIO115 and BIO121.

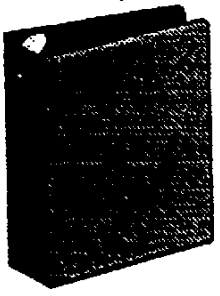


Core module - Module 1
General Microbiology
Notes

All students will receive this.

Authors: Ballantyne and Ash

[1st 8 weeks of Session].



Core Module - Module 2 - Practical manual

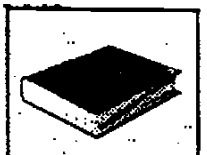
All students will receive this.

Authors: Ballantyne, Ash and Jin

Students will NOT do all pracs; they will be selected as appropriate to their discipline.

Specialist modules - students in different courses do only 1 of these modules.

BIO115



Module 3 Env and Indust. Micro

for Env.Science/ Analysis/ Biotech, and Analytical Chemistry

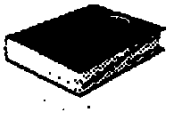
Module 4 Med. Lab Science

for MLS/ Equine Studies and Nursing

BIO1121

Module 5 Wine Microbiol.

for WSC/ Wine Growing only



Module 6 Agric. Microbiol.

for Agric/ Hortic only

Please Note: students enrolled in other courses may study either of two modules depending on the subject in which they are enrolled (i.e. either BIO115 or BIO121).

Figure 1 - Flow Chart of Modules

WHAT IS MODULARISATION?

Modularisation "is a process of redefining and reorganising existing subjects in order to produce sections of work that have recognisable boundaries, objectives, content, self-assessment items, formal assessment, and, very importantly, information on the requirements - either formal or informal (prior knowledge and experience) that are necessary to successfully complete the module. The context of the module - where it articulates with other modules and its contribution to a subject or subjects and course overall - is also a characteristic of a module" Pearce, W. and Wright, S, *A Guide to Modularisation*, p.7.

Modularisation breaks work up into more meaningful, discrete units of work that are student centred. It allows access to high quality modules suited to the particular requirements and needs of students enrolled in different courses.

THE BENEFITS ARISING FROM THE MODULARISATION OF MICROBIOLOGY

1. Student Benefits

One of the goals of modularisation is to create learning environments that are suited to the particular needs of different groups of students. By creating specialist modules (eg Module 4 - Medical Laboratory Science for Medical Laboratory Science students or Module 6 - Agricultural Microbiology for the Agricultural and Horticultural students) tailored specifically to meet the needs of each group of students we have accomplished this goal. For example, a student enrolled in Wine Science would study the basic core modules (Module 1 and 2) in Microbiology and gain a good understanding and a basic knowledge of microbiological principles. The student would then study Module 5 - Wine Microbiology and find a direct relevance and application to his/her course and interests.

The practical component of the subject is also comprised of "core" experiments (which all students do) and specialist experiments which have been carefully designed to meet the needs of students enrolled in different courses.

Another benefit of breaking the subject into discrete units of work is that it allows students some flexibility in choosing the modules that will be of the greatest value to them. For example, students studying Equine Studies in the School of Agriculture will study the Medical Microbiology module from the School of Science and Technology. Students enrolled outside the School of Science and Technology and the School of Agriculture, eg Humanities students, can have a choice of four specialist modules depending on their particular interests.

2. Diverse student population

Modularisation provides open learning material in discrete portions with carefully defined objectives, content and assessment and a structured learning sequence. The subject *Microbiology* has a wide range of students with varying scientific backgrounds. By carefully defining knowledge and objectives, specifying guidelines for student assessment via the module profiles, and by adapting modular principles, we have covered the needs of this wide diversity of students.

3. Specialised Input

The subject *Microbiology* has had the input of six specialists in their chosen fields of study. Each lecturer has contributed to the writing of the specialist modules - *Environmental/Industrial Microbiology; Medical Microbiology; Wine Microbiology* and *Agricultural Microbiology*. Students should benefit greatly from the depth and variety of the material and the diversity and skill of the lecturers with whom they have contact.

4. Staffing Flexibility

Greater flexibility in staffing is available with proportional loads being calculated on a modular basis. This flexibility and reduction in contact time has had particular benefits for lecturers involved with the Internal teaching of Microbiology.

During the first eight weeks of the academic session all students study the core module (Module 1). Internal students attend one three-hour lecture block each week covering common material relevant for all students. Students then break up into one of four groups for the specialist modules taken in the last five weeks of session. Practical classes are given on a school basis.

A careful analysis of the workloads of lecturers involved in teaching the reorganised subjects shows some time savings, eg:

i rationalisation of two subjects to give a common core of eight three-hour lectures gives a total time saving of 24 hours for one lecturer,

ii an unexpected bonus of modularisation in this subject that has led to a further saving of lecturer time has been the subsuming of the subject *Wine Microbiology* (last taught in 1992) into *Principles of Microbiology*. Students who were previously enrolled in *Wine Microbiology* now attempt Modules 1, 2 and 5 of this rationalised subject.

However, production of a new module (Module 4), of work previously not taught means the production and delivery of 15 hours of new lectures for one lecturer.

5 Potential for Subject Revision

Modularisation makes revision easier as individual staff members can work on a discrete part of the subject whilst preparation of the rest of the subject proceeds unhindered. A bridging module for the subject can also be easily added for students who find the core material difficult.

THE PROBLEMS ARISING FROM THE MODULARISATION OF MICROBIOLOGY

Time

The modularisation of the two subjects BIO115, *Microbiology*, from the School of Science and Technology and BIO121, *Principles of Microbiology*, from the School of Agriculture, did not occur without an enormous input of time and energy by all those involved in the modularisation of these subjects. "Teething problems" were legion but usually not unsolvable.

Assessment

1. Pedagogical Issues: Assessment was one area where the differing approaches taken to assessment of the subject and the varying needs of the students from both schools nearly produced an impasse situation. The final and consistent approach was accomplished through major compromise which had gains and losses.

   Previously students enrolled in first year agriculture subjects had found concepts in biology subjects hard to grasp. To overcome this, a rigorous program of assignments with a rapid, detailed return, plus two examinations was implemented. This problem had not arisen for those students enrolled in the subject *Microbiology* offered by the School of Science and Technology because these students had a better foundation in science and were more able to cope with the abstract concepts in science. Much less assignment work was used in this subject.

   A compromise between these two different approaches to the teaching of *Microbiology* was to have one larger assignment rather than several smaller assignments, a mid session and a final examination. In each of these items of assessment, the value of the modules was clearly defined as were the assessment requirements for each module. The structured approach of each of the modules includes self assessment questions for each topic which provides reinforcement of learning for students, negating the necessity for many smaller assignments.

2. Administrative Issues: Further problems arose with the examination schedules and examination scripts. As can be seen from Table 1, students studying Module 4 can be enrolled in both the subjects, *Microbiology* and *Principles of Microbiology*. Also, Associate Students and students enrolled in a Bachelor of Arts do not have a clearly defined module choice. The problem arises with the final examination which contains questions on both Module 1 and the specialist modules.

   To address this problem the following options were considered:

1. Each student would receive an examination paper comprising questions on all the specialist modules (3 - 6);

2. Students enrolled in BIO115 would receive examination papers for Modules 3 and 4 while students enrolled in BIO121 would receive examination papers for Modules 5 and 6. However, students whose course does not specify which specialist module they should study must receive examination papers for all of the modules 3 - 6. It is obvious close co-operation between the lecturer in charge of the subject and the examination section is essential!

The complex problems associated with assessment led to the decision to retain two separate codes to enable us to identify the modules studied by each student. This has simplified many problems associated with assessment.

Timetabling

Another major hurdle that we faced was the timetabling of these subjects. Trying to combine internal schedules across the two schools for lectures, tutorials and practical classes, plus the division of each subject into specialist modules (not forgetting the DE students!) threatened to turn this exercise into a logistical nightmare. As can be seen from Table 2, much wasted space has occurred from the necessity of having to book lecture theatres for the first eight weeks to cover the streaming of students into specialist modules in the last six weeks of session.

TABLE 2

Lecture Theatre	A	B	C	D	E	
Number of students	137	0	0	0	0	Weeks 1-8
Max Capacity	270	30	25	90	30	
Number of students	0	30	23	63	21	Weeks 9-13
Max Capacity	270	30	25	90	30	

WAS THE MODULARISATION OF MICROBIOLOGY COST EFFECTIVE?

An important consideration for the University is to be cost effective in its provision of teaching material. By combining these subjects across two schools, covering both Internal and Distance Education students, so that all students received the same material, did we actually save on printing costs?

A complete analysis of the costs incurred in the modularisation of the subjects BIO115 *Microbiology* and BIO121 *Principles of Microbiology* will be undertaken at the conclusion of this session and reported in a follow-up article.

CONCLUSION

We have purposely written this article as a prologue and will follow up with an epilogue. The answers to the following questions need to be addressed in order to gauge the relative success of the modularisation procedure on the subject *Microbiology*.

1. Did we succeed in our endeavour to carry modularisation to its natural conclusion?
2. Were the enormous administrative problems created by the modularisation of these two subjects worth the effort?
3. Was the push to "bigger" a successful one?
4. Can our existing facilities cope with the need for more and bigger lecture theatres and laboratories?
5. Most importantly - did the students benefit from the new, flexible, innovative approach given to these subjects.

As the old saying goes, "The proof of the pudding . . . . . "

We have designed a student evaluation questionnaire specifically to provide answers to many of the above questions. The results of this questionnaire will be analysed and reported at the end of the session. Hopefully, all the administrative workload connected with the modularisation of these subjects will fade into insignificance with the positive response we receive from students, and after all, isn't this the most important factor?

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