



Australian Journal of
Educational Technology

Development of a model using information technology for support of rural Aboriginal students off-campus learning

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Aboriginal and Torres Strait Islander access to higher education has a short history. In 1969 there were 18 Aboriginal students enrolled nationwide, by 1989 this had increased to 3307 (Bourke, 1991). In 1990 the Federal Labour Government passed the Aboriginal Education Act (AEP) which brought together all education sectors across Australia, to set targets for Aboriginal and Torres Strait Islander participation. Subsequently, by 1995, university attendance by indigenous students rose to 7832. That year, 4532 students commenced higher education, compared to 1750 in 1989. However, recent data suggest that indigenous students' retention and graduation rates are approximately 60% that of other students (Crean, 1995).

At the Indigenous Higher Education Conference in October 1995 the Federal Minister for Employment, Education and Training announced a further \$24 million allocation to projects over the next four years to support indigenous participation. The Hon. Simon Crean (p.4) suggested that a key objective 'could involve the development of new facilities where that is essential in remote locations. It will almost certainly involve a more substantial commitment to flexible, open learning approaches to higher education delivery, to take higher education where it is needed'. \$1.75 million was earmarked for the development of 'an indigenous electronic network aimed at improving access to existing indigenous education and support services in our universities' (p.4). Following the 1996 Budget, the present Minister, the Hon. Amanda Vanstone indicated that she will proceed with the previous government's initiatives.

Coincidentally, Australian Catholic University's (ACU) revised model for indigenous education following a major course review sits well with the Federal Government's vision as articulated by the former Minister.

ACU's Indigenous Education Program

The program

ACU developed and in 1989 implemented its program to serve the education needs of mature-aged Aboriginal people living in outer suburban Sydney and rural NSW and to contribute to overcoming the great shortage of Aboriginal teachers and professionally qualified Aboriginal Education Assistants (AEAs). The course is offered in two stages: three years of successful part-time study yields a Diploma in Aboriginal and Torres Strait Islander Education, and two further years a Bachelor of Teaching. The mixed-mode course structure, an outcome of negotiations with Aboriginal communities during the course development phase, is intended to provide maximum opportunity for the students to sustain their family, work, and other responsibilities, and to maintain strong links with and use of resources within their own communities.

Course delivery up to 1996

From its beginning, the program employed two major approaches to course delivery. The first was face-to-face instruction in the residential schools conducted by specialist lecturers using non-traditional methods. There is emphasis on the mutual education of the indigenous students and their predominantly non-indigenous teachers in this context. The second is the provision of printed, text-based booklets designed to support off-campus study including completion of assessment tasks. Both modes incorporate indigenous perspectives. A support unit (Yalbalinga) staffed mostly by Aboriginal people was established early on and is a vital feature of the university's commitment.

A longitudinal study over four years into their experiences of becoming tertiary students (Grant and Trimmingham, 1993) showed that participants placed great importance on the social and affective aspects which formed a significant component of their educational experience in residential schools. They highly valued face-to-face instruction and modelling of teaching/ learning processes by lecturers, and prized their relationships with Yalbalinga and lecturing staff and their peers. They drew support and encouragement from these relationships. Research undertaken in 1995 indicated that while students did not wish to spend longer periods away from home, they would like more frequent opportunities to interact with lecturers, and with each other (Grant, 1995).

Course review

A major review of the program undertaken in 1994-5 noted data from the longitudinal study cited above and confirmed that while 18 students had already graduated as fully qualified primary school teachers and around 45 with AEA qualifications, a sometimes high attrition rate (up to 60%

among first year students) and a relatively high incomplete/failure rate of a minority of students in individual subject units were issues requiring attention. Time taken to complete the overall program stretched well beyond the five year minimum for some students.

The limited nature of the University's support for students' off-campus study undoubtedly contributed to the difficulties, and it seemed possible that they may have been further compounded by the nature of the study materials provided students. In the context of discussion about the diversity of learning /information processing styles (eg. Gardner and Hatch, 1989) and their importance to pedagogy; and further, the evidence of an Aboriginal preference for kinaesthetic, imaginal, oral, and cooperative modes (Hughes and More, 1993), the reliance on text-based booklets for individual, off-campus work can be seen as limiting the extent and quality of student learning, and in some instances, their success rate in the course.

Following the review a number of decisions were made, to be implemented in 1996. A key one was that further adjustments to the program's mode of offering to improve support structures for second year and new students and to facilitate more effective and systematic off-campus study would be made. The question as to what the model for supported learning should be comprised a significant proportion of the review committee's deliberations.

A model for supported learning: Development and implementation

The model for supported learning developed by the committee and trialed during 1996 had two main features: the establishment of local, community based study-centres enabling access to information technology (IT) and the revision and development of course materials and resources. The latter was to be supported by a National Teaching Development (CAUT) Grant won by the author and a colleague who were both members of the review committee.

Information technology enriched study centres

The climate created by reduced government funding on the one hand and active policies of promotion on the other favours the adoption of information technology for general course delivery, but particularly for distance education. Information technologies 'hold the promise of reducing the cost of the human capital component in [course] delivery' (George, 1992:237) and at the same time are seen as a key to meeting increased demand for higher education including from disadvantaged groups (George, 1992; Crean, 1995).

A DEETYA report produced in June 1996 notes that educators are recognising the potential of information technologies to enhance learning outcomes. Listing these, the report (online version) cites the National

Council for Educational Technology (NCET 1994) which found that effective use of IT can:

- provide the flexibility to meet the individual needs and abilities of each student
- reduce the risk of failure
- provide students with immediate access to richer source materials
- present information in new, relevant ways which help students to understand, assimilate and use it more readily
- motivate and stimulate learning
- enhance learning for students with special needs
- motivate students to try out new ideas and to take risks
- encourage analytical and divergent thinking
- encourage teachers to take a fresh look at how they teach and the ways in which students learn
- help students learn when used in well-designed, meaningful tasks and activities
- offer potential for effective group work.

Information technologies are now basic tools in most work environments and are becoming increasingly commonplace in homes. They have been available in many Australian schools for at least the last ten years (DEETYA 1996). All teacher education students must learn to use them for their own learning needs and so that they are properly equipped to take their place in classrooms on graduation.

The fact that ITs were already being either successfully trialed or fully incorporated in courses offered to remote indigenous communities by universities in South Australia (see George, 1992), Western Australia (Rehn, 1992), and Queensland (Gotts et al 1992, Logan and Sachs, 1992) was very encouraging. They had not so far been used for these purposes in New South Wales.

ACU's plan envisaged the development of local study centres where students could meet regularly with tutors and have access to selected technologies. It depended on the negotiation of access to existing facilities such as schools, community centres and the Open Learning Access Centres (OLACs) already established in some areas by other universities. Such sites could be expected as a minimum to have IT resources such as computers and faxes already in place which could be supplemented if necessary by University purchases. Times of access by students and tutors would need to be individually negotiated once ACU had organised an in-principle agreement and all associated costs would be met by the University. The exception to these arrangements was to be Wilcannia and Bourke, where a combined total of 22 students necessitated the purchase and installation of selected hardware in the three schools to be used as study centres.

Choosing the 'Right technologies'

From among the proliferation of information technologies available by 1995, the vexed question became 'which to choose?' Morehouse and

Stockdill (1992, in George, 1992:238) see the adoption of technology by an organisation as a complex issue. Suggesting that it is 'the result of interrelated actions, forces, and political decisions', they identify five critical factors for the successful selection and utilisation of innovative technologies:

1. educational need
2. user characteristics
3. content characteristics
4. technology considerations
5. organisational capacity

These factors comprise a useful framework for consideration of ACU's requirements, choices, and implementation issues. The political decision of most import was to initiate the model in 1996, although the review recommendations were not finally accepted by the relevant committees until October-November 1995.

Educational need

ACU's program is committed to access and equity in education for indigenous groups and individuals via a course which provides appropriate support structures for study in students' home communities. Support in this context must address matters such as the distance of the students from the resources of the University, both educational (eg. library; computer) and human (for example, the expertise and services of Yalbalanga, academic, and administrative staff) (George, 1992).

Distance from the dominant culture represented by the University may also be necessary for the sustenance of the cultural life of indigenous individuals and communities, and therefore its maintenance should be viewed as a positive (George, 1992). ACU's original and ongoing commitment to a community-based course reflects this understanding. Our model therefore 'need[ed] to be flexible enough to work within both worlds: to fit into the cultural context of the students while fulfilling the requirements of the University' (George, 1992:240).

The specific off-campus educational need of students is to consolidate apply and integrate the learning begun and extended in residential schools, which remain the primary focus for course delivery. Consolidation may require exposure to core and associated course materials and completion of exercises activities, and assessment tasks.

User characteristics

Students in the program enrol under special entry provisions for mature age applicants. The majority have not completed a high school education, leaving on average around the ages of 15 or 16. A proportion have undertaken tertiary preparation courses through Technical and Further

Education (TAFE) colleges. Most of the students are mature women, with family, work and community responsibilities. They usually have little background in the use of IT. Younger students are more likely to have had more years of high school education and some have completed year twelve. They have had varying experience with IT, ranging from none to extensive, in, for example, commonly available computer applications. Recent intakes have included higher proportions of younger men.

Variable work and other commitments of most students mean that reliable common patterns of off-campus study or contact time do not exist, nor could they be organised, except in a very limited way, across a year group.

Most students highly value opportunities for interaction with university staff and with each other at residential schools, and benefit from the support and sharing of experience which takes place at such times. Individuals may feel isolated in their educational endeavours on return to their home communities in the absence of such interaction.

Many students show a preference for the multi-sensory, oral and cooperative learning modes characteristic of many Aboriginal people (Hughes and More, 1993) and less interest in extensive, solitary reading as a strategy. They demonstrate a 'willingness and capacity to embrace innovation where they recognise it to be of value in their cultural context' (George, 1992:236).

Content characteristics

The content of the course curriculum is in large part determined by the subject knowledge and instructional and management skills appropriate to each award, and by the need to induct students into the disciplinary discourses of an academic education. Within these constraints cultural sensitivity is respected in the selection of illustrative text graphics and examples. In addition, interaction and negotiation give rise to multi-way exchanges of information and ideas.

Technology considerations

As with the project reported by George (1992), analyses of educational needs, user characteristics and content indicate that the technologies of choice must have two essential characteristics if they are to be used successfully in ACU's model. They need to offer flexibility, and be capable of promoting interactivity among staff/student(s), student(s)/student(s) and staff/tutor(s), and between student/study material(s).

George (1992) points out that flexibility is also usually required of the equipment supporting candidate technologies. Because of limited funds, readily accessible, multifunctional equipment offers an advantage. Computers fit this requirement - they can be used for word processing, to run instructional packages and often CD-ROM, to send/receive email, and

to access the World Wide Web with its multi-media versatility, its rapidly multiplying educational resources, and its publishing capabilities. Computers are to be found in key sites in almost any community in the state. ACU's plan began with the acceptance of computers with attached printers and modems as the hardware of first choice.

A reliable means of off-campus interactivity is a major issue for all involved with ACU's program. A number of technologies offer either synchronous or asynchronous interactivity (George, 1992). Tele- and video conferencing are examples of technologies offering synchronicity of interaction and therefore immediate feedback capabilities, but they tie sender and receiver to an agreed, specific time. This can be difficult enough in diadic communication and particularly complicated when large groups of people with disparate commitments are involved. The technology chosen must be flexible enough to allow for the cultural, social and work-related obligations of students and staff (George, 1992). While teleconferencing requires relatively low level equipment and organisation, video conferencing across multiple sites is complex and expensive. Both were in the end eliminated as possibilities.

Email and its variants (listservs, bulletin boards) are asynchronous and therefore adaptable in terms of scheduling, but lack the benefits conferred by immediate feedback (George, 1992). They offer great flexibility as regards the number of people who can be involved in the interaction and the manner in which it can be conducted. They were accepted as appropriate for ACU's program, for both the socio-affective support and educational possibilities they promised. The latter included the transfer of textual and graphical materials between and among participants.

Video and audio taped resources (either commercial or customised) offer limited interactivity between student and material if they are accompanied by for example, appropriate questions and worksheets, but considerable flexibility. Most students are able to access the necessary equipment, and can time use of the resource to suit themselves. They, along with computer applications offer variants of the multisensory experiences which are thought to be mainstays of indigenous learning styles. They were identified as appropriate technological choices for the program. CD-ROMs on the other hand offer greater interactivity, but less flexibility as regards the equipment required - not all computers accessible by students read them. They are also expensive to buy in multiple copies and are very costly and time consuming to produce. Few of those commercially available at present are either specifically content relevant or sound enough in their instructional design to warrant mass purchase for off campus use by individual ACU students.

Fax machines offer asynchronous interactivity and are readily available. They too are thought suitable for use in the program.

Since ACU's course is mixed mode with face-to-face classroom activity carrying most of the pedagogical burden the direct teaching possibilities offered by, for example, audiographics, which in any case require real-time interaction, were ruled out. In Appendix 2, technology options considered and their key characteristics are summarised in tabular form.

Organisational capacity

The capacity of the organisation to set in place and support the technology innovation is a major consideration (George, 1992). Constraints imposed by funding allocations naturally exist at ACU, though in a one-off situation occasioned by a special grant, there were sufficient funds to purchase computers (nine in all) for two Wilcannia study centres and a Bourke centre and modems for distribution to a number of centres which lacked them.

Significant organisational problems emerged in two areas as ACU staff sought to implement decisions about the choice and location of the new technology. The first was the selection and establishment of local study centres. Work was begun towards the end of 1995 on identifying and negotiating with personnel at potential sites in communities where the then first year students and the applicants for 1996 admission to the course were located. The process mostly relied on networking using contacts established around the state during the writer's years of academic coordination of the program.

Many representatives of the organisations contacted were receptive, at which point the questions became 'what forms of IT were available, what were their specifications, and what arrangements could be made for student access?' A preliminary, and promising list began to take shape. However, consolidation and amendment could not take place until enrolments were completed some way into the 1996 academic year. In the end, it took almost three-quarters of the semester to arrive at an (almost) finalised list of centres. Ongoing modifications included relocations from sites which at a distance had initially appeared suitable but where difficulties on the ground emerged for one reason or another. Appendix 1 shows the location of finalised study centres.

More serious problems developed around the issues of infrastructure and technical support. Negotiations with the University's Director of Information and Communications resulted in a decision to use a commercial Internet Service Provider (ISP) to service the scattered study centres. Open Net, initiated by the Federal government to establish just such services nation wide and offering a 13 1xxx dial-in phone number at local call rates, software, and a toll-free help line, seemed the obvious choice. In any case, our most remote sites at Wilcannia and Bourke had no other ISP available.

After successful trials in Wilcannia, Walgett, and Macksville, we were ready to send the remaining tutors the connection kits, and modems if

they were needed. To our consternation, late in March 1996 we were notified of Open Net's decision to close down its ISP operations at the end of May. Their cited reasons were that Telstra was changing the price structure for 131xxx calls, and some unresolved funding guarantees by the Federal Government. A few more sites managed to get online before the closure. ACU students were the victims of political decisions made in a highly volatile and competitive telecommunications market.

There commenced another round of discussions about provision of Internet services. The Faculty of Education was fully committed to maintaining and extending student access. Ultimately, ACU agreed to become the service provider, as its own infrastructure had increased in capacity in the interim, and more staff had been employed to provide technical support. A 1800xxx freecall was established for students and tutors dialling long distance. ACU email addresses were set up for all students and tutors, and several support people in one or two communities. Extensive instructions were produced and sent to tutors to guide the reconfiguration of Open Net software to ACU's specifications. Two thirds of the way into the second semester, of a total of 22 sites - 19 around NSW, 1 in Queensland and 2 in Sydney - 14 had achieved connectivity.

The main factors accounting for the failure to achieve 100% connectivity appear to be: first, while they had agreed in principle to undertake the task, some students' tutors were uncertain about or unwilling to tackle admittedly the quite difficult task for the technologically inexperienced of installing and configuring the necessary software. Second, access to some sites proved more difficult than expected. Third, some students were reluctant to liaise with their tutors over the task of installation.

Where connectivity was easily achieved the following factors were important: first, highly supportive key personnel (eg. the Principal at a school used as a site) who go out of their way to ensure successful access and installation. Second, a good relationship of some duration with tutors which makes negotiations easier (eg. as with two people who have participated as regional tutor coordinators as well as tutors over a number of years with the program). Third, on the spot organisation of the site and connectivity by ACU staff (eg. the lecturer in Information Technology who set up the study centres in Wilcannia and Bourke).

Student use of information technology

A total of 30 students in first and second year of the revised course were taught to use IT over two semesters in residential classes. Although they were off to a sometimes shaky start, by the year's end, in almost all cases, they were using IT with a high level of enthusiasm and reasonable competence. Their motivation was enhanced by knowing that they were successfully employing technologies that most people in their local areas

were only just beginning to be aware of. They:

- learnt to understand a range of information systems (word processing, database, graphics etc.)
- used email to communicate with lecturers and each other, and in some instances with the wider Internet community (eg. a student works as a part time tour guide at Mootwingee National Park near Broken Hill gave her email address to some international tourists and now communicates regularly with them)
- used email to send assignments to lecturers
- produced video-graphics illustrating Aboriginal themes and legends using software such as they might find in schools (children at Wilcannia Central School who were shown what their AEA had produced were highly excited to see a well-loved local story so represented)
- employed computers as a 'productivity tool' for writing and illustrating
- explored the World Wide Web and contributed their autobiographies (the result of a learning task integrating concepts and processes across three curriculum areas) to the Yalbalinga Web Site
- began tentative participation in a recently established listserv

With wide variation in student opportunities to consolidate their skills in off campus study time the major problem overall was access and equity. However, it is still possible within the constraints mentioned to describe students' introduction to and use of computer based information technology as a great but qualified success. Apart from the issue of connectivity for all, the major remaining difficulty seems to be that of students, tutors and staff new to the technology getting used to using email as a routine tool for communication and support. Some who have access are still very tentative travellers down the IT road.

Revision and development of course materials and resources

Thorough revision and redevelopment of course materials is a necessary part of course review. The major aim in this instance was to create synergistic combinations of techniques and technologies for flexible course delivery which would call on a fuller range of student learning styles and produce more effective learning outcomes. Following the decision to use new technologies and with a National Teaching Development (CAUT) Grant for support, lecturers were encouraged to consider how they might develop off-campus study materials incorporating technology where appropriate. They were invited to attend a comprehensive all-day seminar/workshop on communicating with learners at a distance' offered on two occasions by Educational Media Services, University of Wollongong, which brought them up to date on various options for flexible course delivery. Other staff development days were held on the Internet and supported learning and the production of distance education print materials.

Perhaps one-third of the lecturers were able to integrate IT-based tasks and activities into the work students were expected to undertake at home and at residential schools. The tasks required use of email, the World Wide Web, and audiotaping. Although expectations had to be modified because of the difficulties with connectivity and study centres outlined above, a number of the activities were successfully undertaken during residential schools. Once the issue of the suitability of an IT had been resolved, lecturer familiarity and confidence with the available technologies influenced whether or not they adopted them in their subject units.

Most ACU staff have themselves only recently been exposed to the newest forms and vary greatly in their attitude to and acceptance of them. An additional factor is the general level of pressure under which academics operate: involvement in the course is just one area of responsibility to be juggled with many others, and the innovative use of new, perhaps unfamiliar technologies requires a great deal of time spent on careful planning and production.

CAUT grant funds were offered to assist those lecturers prepared to create IT and other kinds of learning resources. To date, the following projects are complete, or nearly so:

- a video demonstrating a Science and Technology investigation lesson with Aboriginal and other primary school children
- a video on learning about aspects of the development of Aboriginal children, for a core unit in Child and Adolescent Development. The video features a teacher graduate of ACU's program working with Aboriginal children of different ages. It is accompanied by a printed publication
- a World Wide Web site on the course and its stakeholders, particularly first and second year students. Its address is:
<http://www.acu.edu.au/atsi/yalbalinga/welcome.htm>
- print publication in booklet form of first year students' stories about a person they most admire

Conclusion

The implementation of the model to date has been imperfect at best, yet the basic framework and features were achieved. Indeed, an improved retention rate is already evident in the Wilcannia-Bourke group, where 17 out of the original 22 students completed their first academic year. On the other hand, there was a loss of 12 out of 24 students in the 1996 Sydney based intake. A significant difference between the two groups was that electronic connectivity with the university for students and tutors was established very early at Wilcannia and Bourke, and was used regularly throughout the year.

Reflection on the experience of trialing the model during 1996 suggests these recommendations:

1. there should be a reasonable lead-up time before the implementation of the model; in order to effectively undertake the following through localised rather than remote activity:
 - basic skilling in IT for tutors
 - identification of appropriate study centres followed by supplementary resourcing if necessary, and the installation of Internet connectivity software. The recruitment of someone attached to the site who is able and willing to support the student and tutor and assist access to the centre and use of the IT is highly desirable.
2. the university should be the course ISP, either using its own computing and other infrastructure, or that of other universities. Commercial ISPs may be too expensive, too subject to unpredictable market forces to provide an enduring service, or both.
3. lecturing and support staff need professional development in the educational and support uses of IT and opportunity to develop the relevant skills.

Finally, an encouraging comment from a senior Aboriginal educator whose advice was sought about the employment of new technologies for flexible course delivery to ACU's Aboriginal and Torres Strait Islander students was:

It's a brand new venture for Aboriginal students. For once they're getting in at the embryonic stage of development. Aboriginal people shouldn't have to come into this new area with a deficit.' (Jim Miller, March 1996; verbal communication)

Acknowledgments

Des Matejka, who led the development and implementation of the communications technologies components of ACU's model for supported learning, teaches the Information Technologies unit in the program, is co-applicant and co-administrator of the CAUT grant, and made helpful suggestions for this paper.

The Department of Employment, Education, Training, and Youth Affairs, which awarded the National Teaching Development (CAUT) Grant whose use has been described.

Aboriginal advisers James Miller, Frances Dobie, Darryl French, Albert Torrens, for many helpful and encouraging comments about the model; and Mary Button for advising on and assisting with the production of one of the video resources.

ACU staff, tutors and students who participated in the trial of the model throughout 1996 and graciously coped with the strains and difficulties.

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This is a revised version of a paper presented at the ERA-AARE Joint Conference, Singapore, 25-29 November 1996.

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Please cite as: Grant, M. (1996). Development of a model using information technology for support of rural Aboriginal students off-campus learning. *Australian Journal of Educational Technology*, 12(2), 94-108. <http://www.ascilite.org.au/ajet/ajet12/grant.html>

Appendix 1: ACU Study Centres 1996



Appendix 2: Information technology options for flexible teaching and learning

Vehicle	Who can receive	What it can do	Storing signal	Cost
1. Video conference (via terrestrial)	Sites connected to an ISDN network, and a suitable space to locate delicate and expensive equipment.	Transmission between connected sites - flexible. Teaching/ tutoring/ student activity/ Administration.	Can be recorded at the originating and receiving sites for later distribution and/or replay if required.	Expensive encoding and decoding equipment needed at each site. Costs proportionate to number of sites linked - pay as you use.
2. Computer data transmission 2.1. Internet (email, news-groups, bulletin board, databases, library catalogues, multimedia, etc.)	Teacher and tutor. Teacher and student. Student to student (ie, one to one or one to several).	Allow rapid communication once telephone connection has been made and Internet access organised.	Could be stored on disk but probably not necessary.	Requires computers and modems at each point plus access to telephone. In some instances a commercial Internet service provider will be required.

2.2. Non Internet (email, newsgroups, mailing lists, etc)				
3. Computer based 3.1. Specialist software (eg Electronic Classroom; audiographics). 3.2. Multimedia (combines text, graphics, sound, video, animation).	3.1. Central site to those connected by dedicated telephone lines. 3.2 Any computer user.	3.1. Can be used for teaching purposes - a teacher to a number of students. 3.2. Can be used by individual students, is interactive and addresses a range of learning styles.	3.1. Can be stored on disk 3.2. May be stored on and accessed from a disk, file server, CD-ROM or the Internet.	3.1. Requires computers and modems plus appropriate software and graphics tablets. 3.2. Requires a computer with a CD-ROM drive, or access to a file server or the Internet. High quality multimedia is extremely expensive to develop.
4. Fax to fax	All students with access to fax machine.	Send and receive handwritten typed, graphic or photographic (b/w) information.	Print originals as a basis. Intermediate messages, assignments need to be photocopied for durability.	Requires fax machines at distribution and receipt points. Ongoing costs, fax transmission charges.
5. Teleconferencing	All students with access to a telephone.	Provide personal audio support for isolated students who can also consult each other through 'bridge'.	Recording is possible but judged unnecessary in most instances.	Cost of telephone installation and hire plus ongoing STD charges. 1800 numbers will keep those costs with host.
6. Print supplemented by audio, video, still photos et al.	Any student postal service. Needs appropriate replay equipment. Respond by mail and/or phone, fax, et al.	Deliver materials (eg audio tape, video tape, disc, print) developed at a central point.	Has been copied from master.	Expensive to produce initially but easily able to be copied in bulk. Updating costs variable.

[Note: Queries/problems from tutors and students - use fax, phone, electronic mail or mail for support from central or regional point] Adapted from Miles, P. (1992-93). *Communications Technology Feasibility Study*. Bachelor College.