

DELIVERING EDUCATION WITH CONTEMPORARY TOOLS

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Abstract: *Education has embraced new technology as a delivery mechanism, especially that provided through the use of the World Wide Web (Web). Educational programmes in Cartography and Geographic Information are not an exception to this trend and much course content is delivered in this manner. The continued use of the Web for education assures continued development of innovative educational products. This paper elaborates on the different approaches taken by both universities and 'non-conventional' education provision organisations and educational consortia. It also explores the use of contemporary communications and media within educational packages. Finally, it proposes method by which the wider Cartographic and Geographic Information community might consider for delivering educational programmes remotely.*

INTRODUCTION

Education has always used new media and innovative methodologies for teaching existing subject matter differently and to explore how new topics can be included in curricula through the application of different approaches within a certain discipline area. The increased access to sophisticated computers by the general public has led to awareness that resources like discrete multimedia products and their distributed counterparts on the Internet, and particularly through the use of the World Wide Web, has revolutionised the way in which information is both accessed and used. Educators have embraced the use of interactive multimedia, delivered via discrete or distributed means, as a method of providing products useable with 'everyday' skills, with modest computers and accessible communications resources like the Web.

EDUCATION AND LEARNING MATERIALS

To address the need to provide education using innovative tools general education in Australia can be used as an example of facilitating education programme delivery over a whole continent. The reality of this task means providing education in both the heavily populated coastal 'strip', dominated by capital cities, where some 90% of the country's population reside, and also providing for rural schools and schools in the outback. Since outback schools had a very large 'catchment' area, but relatively few 'heads per square kilometre', normal schools and classrooms have historically been impossible to provide in remote areas, both physically and economically. Improvisation and the application of (available) technology have been, historically, the order of the day. There has been much interest in developing strategies, and associated content, for providing education to local and 'remote' students. Taylor (1999, cited in Markus, 2005) recognised that there were a number of models of distance education provision: correspondence model; multimedia model; tele-learning model and the flexible learning model. Markus contends that a fifth model is beginning to emerge, one that uses an automated response system to be able to respond intelligently without human intervention. Taylor (1999) called this the intelligent flexible learning model.

This paper begins with a general overview of the technologies that have been used to provide education in rural and outback areas of Australia, so as to build a picture of the foundations of innovative use of technology to support educational delivery. It also showcases how Australian educators have embraced technology as a means of providing quality education that would otherwise be impossible to deliver. Later parts of the paper, that address the use of contemporary communications technology, should be made with due reference to the trials and methods that have been employed pre-New Media and pre Web. These technologies might have been as simple as using the mail to facilitate the movement of teaching materials between teachers and their (virtual) classroom participants, or more technology-enhanced means like the use of a phonograph, bringing the world to small, isolated classrooms.

DELIVERY OF DISTANCE (ONLINE) EDUCATION

As noted previously, in Australia there has always been a demand for distance education. This involved, at the turn of the century in Queensland, having itinerant teachers visiting hundreds of families on several occasions throughout a school year to provide educational support, where children were educated at home (Fowler, 1987). Communications systems,

initially the post, and later radio and satellite communications were used to provide educational support. This section of the paper briefly outlines some of these communications and technological applications.

The use of the Post - Correspondence schools

In the State of Queensland, a state with a very low population in rural areas, the Primary Correspondence School was fully developed in 1922. At its peak in World War II there were over 7000 children in the system. In 1986 there were still 1700 children enrolled (up to grade 7) (Fowler, 1987). With a Brisbane base, where all materials were produced and marked, the mail system was used to post, either weekly (grades 1 to 3) or fortnightly. Some of these printed materials were supplemented with audiotapes when this became feasible. A 'Home Tutor', a parent or governess was also part of the education 'chain'. This person organised and supervised the programme (Fowler, 1987).

School of the Air

The School of the Air started in Cloncurry, Queensland in 1960. It was designed to supplement Correspondence School materials, by providing oral elements (Fowler, 1987, Alice School of the Air, 2005). The School of the Air (SOTA) was the means by which many Australians in remote areas received their education. For example, the Cairns School of the Air offered radio lessons to children enrolled with the Primary Correspondence School in Brisbane and used transceivers, like that illustrated in Figure 2 (Cairns School of the Air, 2005). The radio frequency used was that of the Royal Flying Doctor Service. As well as Queensland, Western Australia had five School of the Air centres (serving 135 students) and one South Australian SOTA was based at Port Augusta.

UHF radio has also been used to 'connect' schools and children in classrooms. The Victorian Country Education Project trials used two-way UHF radio to provide one-way and two-way communication. This was later replaced by microwave connections. In 1985 the Western Australia Education Department experimented with satellite communications plus JF radio for 'downloads' and a combination of HF radio, telephone or satellite for return paths (Fowler, 1987).

Telephones

Telephones have been used to connect students to teachers and students to students for class interaction. In 1983-84 South Australian correspondence schools used loudspeaker telephones for two-way communication. This was especially successful for practical music teaching and languages (Fowler, 1987). Later, with the general access to university-supplied computer systems via modems this method became redundant.

Video and Videoconferencing

In the early 1980s the Australian Federal Government introduced its Federal Government Loan Video Scheme, which involved 142 children. The scheme used the Australian Broadcasting Commission's (ABC) School's Broadcasts and enabled State Education Departments to copy and make available off-air videos. This was supplemented with local (State) education video resources. Education Departments also loaned Video Cassette Recorders (VCRs) to families on an 'as-needed' basis. Late night broadcasting (and subsequent video recording of lectures was used by the Western Australian College of Advanced Education for its BEd program (Fowler, 1987). Once feasible, videoconferencing was used to facilitate, mainly multi-campus, lecture delivery.

Videotex / Teletext – Viatel

Viatel, a public videotext service provided by Telecom, based on the UK's Prestel service (Inglis, 1984), began in Australia in 1985. Viatel was used by the New South Wales Correspondence School, the Education Department of Western Australia (which used the BBC Acorn computer and had the ability to emulate Prestel information) and the Education Department of South Australia (Hosie, 1985). Access to distance education courses using Viatel was facilitated via the Mentor "Coursefinder", established by Inglis, at RMIT in Melbourne (Atkinson, 1987).

Computers, cables and modems

Lundin (1995?) saw that there were at least five different types of computer services relevant to education and training, namely: electronic mail (email); bulletin boards; database/library access; computer-text conferencing; and file transfer. Whilst an effective teaching application as a stand-alone device, the computer facilitated a better approach to distance education provision when connected by telephone cables, and later, communications systems.

Education's interest came about when home computers became affordable and also when the attitudes of telephone network authorities to data communicators changed in the late 1970s - early 1980s (Atkinson, 1986). This method of student access to educational resources was of great interest, as all students needed to be 'connected' was a home computer, communications software, a modem and a telephone. Local area networks (LAN) were also established for on-campus access. In 1985 the Western Australia Schools Computing Branch used electronic mail between numbers of its country schools using microcomputers connected via telephone modems. It was used to provide a means to build a student community and to facilitate submission of assignments and essays (Fowler, 1987). The system improved markedly when file transfer ability was added to bulletin board services (Atkinson, 1986). In 1986 there were over 100 bulletin boards in Australia (Withers 1986, cited in Atkinson, 1986), and, by the end of the 1980s, there were over 180 (Withers, 1987, cited in Atkinson, 1987). The interest in Bulletin Boards for educators is reflected in the number of resources available, like 'cookbook' texts that facilitated the construction of teaching components.

Satellites

Using satellites as an alternative to radios for remote education provision was trialled by the Queensland Education as an adjunct to its oral resources provided by radio. A so-called Homestead and Community Broadcast Satellite Service (HACBSS) enabled remote users, with an appropriate satellite dish to receive television programs from the Australian Broadcasting Commission (ABC) and commercial programs as well. 'Off-peak' broadcasting time was used to transmit educational programs for recording and for replay during school hours (Northern Territory Treasury, 1997). The Australian satellite, AUSSAT, was used for this purpose (Fowler, 1987). A combination of Apple IIe computers, satellite-delivered videos and a fortnightly two-way video link provided a 'suite' of materials and teaching methods which, when combined, gave students a rich multi-medium experience.

Currently a satellite system is being used to deliver e-Learning programmes in India (Ravichandran, 2005). The VSAT (Very Small Aperture Terminal) network is delivering video broadcasts of educational material for India's Virtual Tele Ed™ learning services. Teaching is provided as voice, video and computer-based educational services.

NEW MEDIA EDUCATIONAL PACKAGES

Since the mid-1990s educational packages have used New Media - HyperText, CD-ROM and the Web - to provide timely and comprehensive map-enhanced learning suites. There have always been packages available that teach the basics of geography and mapping. Many have been produced as paper products, but more recently the publishing platform has migrated to CD-ROM (mainly from commercial publishers) and to the Web (governmental agencies).

Education on-line

The means of delivery have changed, as also has the market for distance education products. Governments now have economic incentives to provide on-line information, after making massive investments in computer and communications technologies. For example, Egypt has provided a free Internet access service since 2002, with users only having to pay for a local dial-up telephone fee (Baraka, 2005). Online education facilitator NextEd reported that at the turn of the millennium there were approximately 80 million students enrolled in higher education programs worldwide (1999), and of these 6+million were online. To illustrate the economic importance of teaching to a country like Australia, at around the same time, the total value of Australia's education exports was A\$3.182 billion. The student profile is also changing. Using the Australian example again: of an estimated 85,900 international students studying in Australia in 2000, 70 % were on campus in Australia, 7 % off campus by distance education, and 23 percent were studying at offshore campuses (NextEd 2000). Hilsberg (1999) saw the market for on-line education being in three areas: enhanced on-campus learning; infrastructure for twinning arrangements; and part of distance education.

Many Australian universities are looking beyond the domestic 'marketplace' as their delivery 'catchment area'. In the Asian region there are approximately 25 million students in higher education (post-secondary education, including Australia and New Zealand) and there were roughly 4.1 million students who studied via distance education in 2000 (NextEd, 2000). This demand led to a number of different methods of operation to service both the domestic and the growing regional market. The following section provides information on the various delivery strategies

ON-LINE EDUCATION – DELIVERY STRATEGIES

Many universities have developed a ‘taste’ for using online resources to either supplement face-to-face delivery or to provide alternative delivery methods. Online education can be used to support ‘conventional’ teaching, either on-campus, or spread over multi-campuses. Flexible delivery can also provide adjunct courses for industry, as ‘single subject’ or ‘short course’ offerings, that would be otherwise impossible to deliver remotely or at times that best suit part-time students. There have been a number of different strategies followed by Australian Universities for providing on-line educational courses. This section of the paper looks at some of these.

Remote delivery by existing universities

Many Australian universities have been involved in overseas ‘ventures’. For example RMIT University owns operations in Australia, Vietnam (Web-delivered courses and local tutors and buildings), Singapore, South Korea (Computer Science courses delivered remotely), China and Malaysia. Universities are also ‘twinning’, demonstrated by Latrobe University’s partnership with 13 Chinese universities. RMIT University has an alliance with the Singapore Institute of Management for the delivery of courses. There also exist global alliances like Universitas 21, a company incorporated in the United Kingdom with a network of 18 universities in 10 countries.

International providers

There exist a number of overseas universities who see the English-speaking world as their marketplace. For example, The Open University has been a provider of courses to many disciplines, including geography. And, the Massachusetts Institute of Technology (MIT) has promoted further use of the Web for program delivery, making many entrée courses free. In an official announcement on April 4 2001 the MIT President, Charles M. Vest stated that the University would make its materials for nearly all of its on-line courses freely available on the Internet over the next ten years (MIT, 2001a). In a statement from the University (MIT, 2001b) it was noted that: “The idea behind MIT OpenCourseWare (MIT OCW) is to make MIT course materials that are used in the teaching of almost all undergraduate and graduate subjects available on the web, free of charge, to any user anywhere in the world”. A pilot program began in late 2001, with a goal of making over 500 courses available on the World Wide Web over the following 2 1/2 years (MIT, 2001b). In the English-speaking world, access to MIT OpenCourseWare (MITOCW) program will change forever how universities will approach the development of their unique on-line program offerings.

University alliances

A number of universities have formed alliances to market their programs more effectively and to provide a much demanded ‘internationalisation of their programs. For example, in 1998, MIT joined in an alliance with the two leading research universities in Singapore -- the National University of Singapore and Nanyang Technological University – “to explore the application of information technology in the creation of a new global model for long-distance engineering education and collaborative research” (MIT, 2001b). This established US-Asian links for facilitating part of a global education provision scheme. And, there was enterprise between MIT and England’s Cambridge University to develop educational and research programs designed to “stimulate the development of new technologies, to encourage entrepreneurship, and to improve productivity and competitiveness” (op cit.). Of note is the fact that a key component will be an undergraduate student exchange program. Also, under the Global Campus project, Middlesex university, with partners in Egypt, China and Singapore offer a MSc program in business information technology (Baraka, 2005).

Private companies and corporate/university alliances

Of interest to academics is the entrance into the online education scene of providers who are partnering universities for the delivery of educational materials. Companies like News Corp see themselves as ‘players’ in future education provision. This company predicted that 60 million students in higher education at the end of the last millennium would grow to between 180 to 200 million over the following 20 years and that governments or private institutions will not be able to provide for this demand using traditional methods of delivery (Rose, 2000). In May 2003 Newscorp signed a memorandum of understanding with in Universitas 21 (Dimson, 2003). The British Broadcasting Corporation (BBC) offers resources for and courses in many disciplines under its BBC Online / BBC Education banner (figure 1a). In Australia, the Australian Broadcasting Commission (ABC) offers a similar service (figure 1b). In the Geographic Information industry ESRI offer online courses relating to its software products.

A number of private companies have moved into 'mainstream' online education 'ventures. China TV University has some 500,000 students. (Information via their Web site (<http://www.crtvu.edu.cn/>) is only available in Chinese). And, the figures from another private 'education supplier', Henley Management College, which provides courses up to DBA, PhD and MPhil, has a US\$2.5 billion market with over 20% growth annually. The Economist Intelligence Unit (EIU) ranked Henley as the No. 2 full-time MBA in the UK and the 7th in Europe. Whilst the Financial Times rated their modular MBA as 6th in the UK, 10th in Europe and 25th worldwide (Henley Management College, 2005).

ON-LINE EDUCATION AND CARTOGRAPHY

Educational packages have used Hypertext, CD-ROM and the Web to provide timely and comprehensive map-enhanced learning suites. There have always been packages available that teach the basics of geography and mapping. Many have been produced as paper products, and then the publishing platform migrated to CD-ROM and then to the Web. The wide range of Web-delivered education-packages has enabled even simple classroom exercises for elementary geography students to have a global dimension. Some of these programs are listed to illustrate the range developed:

- The History of Cartography project - <http://feature.geography.wisc.edu/histcart/>
- Mental Maps (MMap) - a program that allows students to test their knowledge about the location of cities. <http://geosim.cs.vt.edu/mmap.html>
- The National Geographic Society's Geography Education Program – <http://www.nationalgeographic.com/resources/ngo/education/ideas.html>
- Mapping the World by heart - <http://www.mapping.com/maps.html>
- Unit 006 - Human Cognition of the Spatial World - part of the NCGIA Core Curriculum in Geographic Information Science. <http://www.ncgia.ucsb.edu/education/curricula/giscc/units/u006/u006.html>
- The Open University on TV - Open2.NET, an OU/BBC enterprise. <http://www.open2.net/>
- Cartography and Geographic Information Systems Laboratory, Department of Geography / Geology, University of Nebraska at Omaha. <http://maps.unomaha.edu/demo/demo.html>
- Birkbeck College, The University of London has provided an on-line Masters Degree in GIS for a number of years. The program is conducted entirely on-line and students are not obliged to attend courses.
- City University's Department of Information Science introduced their on-line Master's program in 2000. It also can be completed entirely on-line, although a face-to-face program is also offered (City University, 2000).
- Penn State's World Campus provides an on-line Certificate in Geographic Information Systems. This non-credit programme is designed for a range of professionals who do not have a formal qualification in GIS. http://www.worldcampus.psu.edu/pub/gis/afs_who.shtml

Many courseware products are available on-line and the sheer number provided makes it impossible to really talk about them all. As well as single product offerings from Universities and societies, there have been concentrated efforts to provide access to courses nationally. United States geography academics (with some international partners) have established an exceptional example - the 'Virtual Geography Department'. It provides unlimited (free) courses via the Web. A consortium of university academics have provided individual programs that students can undertake to supplement programs offered by their home departments. Part of this program is the section entitled: Cartography and Map Interpretation. It should be noted that these courses do not, when combined, provide a program leading to a formal academic qualification. They provide needed adjunct materials that ensure that students in geography have access to a wide range of courses that could not be provided by home universities due to the wide scope of the courses on offer.

FACILITATING THE DELIVERY OF CARTOGRAPHY AND GEOGRAPHIC SCIENCE EDUCATION PROGRAMMES

The ICA Strategic Plan provides a number of guidelines for implementing an Education plan. It covers both Education and Professional Practice. The Strategy Plan proposes that the ICA should:

- Investigate ways to strengthen and monitor education programmes in Cartography, GIScience and related subjects at all levels: University; High school; Elementary; and Life-long learning
- Providing fora for discussions of education programs and curricula in Cartography and GIScience.
- Develop information networks and virtual universities on Cartography and GIScience.
- Organise educational courses on Cartography & GIScience in developing countries and for regional purposes.
- Offer 'master classes' in GISystems/mapping to guide managers in spatial decision-making.
- Investigate methods (and funding) encouraging student & other young members to participate in ICA work.

It proposed the following actions:

- To analyse existing university curricula in Cartography and GI Science, and encourage promotion of the goals contained in the ICA mission.
- To help widen the Cartographic/GIScience knowledge base and skills into new segments of Society
- To increase efforts directed to capacity-building, especially in developing countries, especially with reference to human resource development
- In co-operation with commercial suppliers, to develop virtual academy courses on Cartography and GIScience to support and complement what is currently available.
- To provide geospatial data for educational use.
- To establish a network of university/school teachers to provide a forum for discussion and possible support.
- To extend travel awards for young scientists; lower conference participation fees for students.

There exists the need to implement and promote activities and programs that champion and provide platforms for developing cartographic education and ensuring global access to programs by all member countries. Courses and programmes on-line, via discrete media (CD-ROM) and via conventional paper products. Already the ICA Education Commission on Education is providing on-line and associated programs (Fraser and Zentai, 2005). Overseeing and developing ICA courses is a mammoth task, and perhaps the Education Commission could work in conjunction with ICA Commissions and Working Groups to develop modules for specific or specialised subject areas, using guidelines and templates provided by the Education Commission. In this way a much wider suite of educational programmes could be developed and delivered, without imposing a large burden on the Education Commission members. Obviously, the Web can be looked upon as a means for delivering collaborative cartographic education materials. Through collaboration programmes can be jointly developed and maintained, and necessary content can be made available where the demand exists, and not only where a 'critical mass' of 'face-to-face' class delivery is possible. The best delivery methods, allowing all member nations to participate, need to be identified and appropriate strategies for education delivery developed.

CONCLUSION

This paper has addressed the development of New Media as a tool for teaching. It has focussed on the use of the Internet, and particularly the World Wide Web, as a contemporary means of enhancing face-to-face programmes for provisioning/delivering distance education courses. It concluded by addressing the effectiveness of the use of New Media for the delivery of educational programmes for Cartography and Geographic Information.

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