The Time is Right - an ICT framework for Networked Learning

Terry Morris

Otago Polytechnic, Dunedin, New Zealand

terrym@tekotago.ac.nz

terrym@schools.earthlight.co.nz

ABSTRACT

The paper describes the evolution of a networked learning system applicable to teacher professional development and the education of full-time degree students within New Zealand during the years 1993 - 2001

Keywords

Teacher, development, internet, student, degree, streaming, dataconferencing, Zealand

SETTING THE SCENE

Widely scattered communities are a typical, perhaps enviable feature of rural New Zealand but inevitably they present difficulties for the country's education system. The difficulties have been compounded in recent years by changes in educational practice as well as the dynamics imposed by the ever-increasing pace of technological change.

A general networked learning strategy, known until recently as "Internet Otago", was developed for a number of different educational targets:

Degree students (Otago Polytechnic Bachelor of Information Technology, BIT)

Teacher professional development

School technology education (Year 3 – Year 13)

The strategy was not developed overnight. Admittedly, though, it evolved through heuristics, incremental solutions to individual problems of delivery arising over the years and, unashamedly, a keen interest in the application of technology to the delivery of education .

Nevertheless, it is clear from a survey of the current literature that technology is not always respected as a driver, a harbinger of process change in education. The contention is understandable. However, no apologies are made here for its regular appearance although its principal effect seems to be that of enablement; its increasing sophistication and capability increasing the quality and completeness of the distance-separated human to human interface. A "value-added" quality also becomes apparent as the evolutionary tale below unfolds.

ICT: A FIRST ANSWER TO THE DISTANCE PROBLEM

In 1993, a need arose to deliver specialised IT courses at Otago Polytechnic's Cromwell campus, about 2 hours drive from the main institution. Clearly inefficient, i.e., unaffordable, to base staff permanently at Cromwell or to drive them out each day, attention turned to a then newly purchased PictureTel 4000 ISDN video conferencing system which included a flatbed document transmitter. These, of course, were early days, and the development of alternative, asynchronous strategies were some way in the future.

Early experiments quickly led to the conclusion that lecture delivery to an electronically linked combined class was quite feasible. One problem remained and that related to working with the Cromwell students during practical sessions.

A close examination of the PictureTel system revealed an inconspicuous interface called "PortB". The technical literature observed it was possible to reserve part of the communication bandwidth for serial transmission. From there it was a short step to install one of the then new remote control applications, NetSpec's "CloseUp" on two computers at either end of the serial link and to work with the distant student on their computer.

It is not intended to dwell on technology but the early discovery of the technique now known as "Application Sharing" immediately appeared to have enormous value in any future distance education strategy.

The PictureTel system was not the complete answer to our problems. Although the educational opportunties of using it were numerous, both the hardware and the ISDN link were far too expensive for general use and mobility was a problem. Unanswered too, was the question of what a remote student might do when needing help with application software and the communication system was unavailable.

THE EMERGENCE OF THE INTERNET

Otago Polytechnic acquired Internet access in 1993 and e-mail and allied technologies such as list servers quickly became popular amongst computer literate staff. The dream of the ITE (Information Technology and Electrotechnology) school, however, was to be able to conduct PictureTel style activities over the Internet. Sadly, essential bandwidth improvements and suitable software were some distance in the future.

The Internet, however, brought with it new technologies and hence new and novel curriculum requirements for the Polytechnic's IT programmes. One of the most obvious was the World Wide Web (WWW), whose inherent usability exploded in 1993 with the appearance of Illinois University's NCSA's Mosaic browser.

Ignoring the hotly contested but here peripheral question as to whether technology truly drives educational practice, it was clear the WWW would henceforth be an essential curriculum component. Almost simultaneously, it also became clear that WWW documents, with their hyperlinking and multimedia capability were an intriguing platform for content delivery.

THE NEED SPECIFIES THE TECHNOLOGY

The widespread appearance of two more, affordable, contributory technologies, CD-R and Lotus ScreenCam (screen capture software) a year or so later offered partial solutions to distance education course delivery. Additionally, ScreenCam type applications such as TechSmith's Camtasia, a latter-day offering, lent a much needed asynchronous aspect to course presentation.

CD-R doesn't offer the immediacy of the Web, but in general Web-container technology, i.e., using the HTML page as access points for other media types, runs as well (including streaming, event-driven media such as Windows Media) from CD as from the Internet whilst avoiding dropouts and severe bandwidth constraints.

Screen capture software is in a class of its own. Presenting itself as an asynchronous solution for application and programming software tutorials it is a good example of an unanticipated-at-the-time value-added contributor to traditional teaching laboratory practice.

Contemporary computer environments are often driven by rapid and frequently complex successions of keystrokes and pointer actions within kaleidoscopically detailed dialogues. Quite often, too, the ostensibly helpful action of a tutor degenerates into a fusillade of keypresses, menu accesses and dialogue traversals. The expectant student has the immediate problem solved but still has no idea of the nature of the solution expressed in terms of application control. Screen capture software with voice-over solves the problem at a stroke. With VCR type controls, students can work through application techniques, stopping and replaying actions at will.

A FIRST STEP TOWARDS NETWORKED LEARNING

With an emergent interest in the national delivery of teacher professional development and the discovery of the need to explore the educational capability of new technology both CDROM and screen capture software allied with the Web were used to create the foundation for the experimental "Writing for the Web" course, launched on CDROM at the start of 1996. All course materials (Web pages and ScreenCam movies) and software were presented via the CD and tutor-student communication employed an in-house mailing list server and an Internet Relay Chat (IRC) channel. Every student had their own Web site and a free and very capable graphic interface Web editor.

Although advertised nationally, the course enjoyed limited subscription. The reasons were self-evident. At the time, few schools had Internet connections and few teachers were aware of the Web and its educational potential. Of those that were, only a fraction had sufficient computer literacy to install and use the software, let alone follow the course work.

The communication system also left much to be desired. The technology worked well enough in itself but it didn't work too well for the users. Those without efficient keyboard skills showed little inclination to take part.

DATA CONFERENCING AND THE PROMISE OF THE VIRTUAL CLASSROOM

A major breakthrough in enabling technology took place around late 1996 with the release of Microsoft's NetMeeting. Microsoft are often criticised for poor initial software design and implementation. Not so with NetMeeting.

The software included multi-point text chat, sound communication with auto-codec selection, point-to-point file transfer facilities and whiteboarding. However, the earlier experience with the PictureTel systems made the inclusion of application sharing a matter of critical interest.

At the time, there was considerable interest in Internet videophone technology and the advocates of its software were vocal, numerous and platform partisan. Earlier experience had taught, however, that although video was attractive it was not essential to the restricted purpose of the remote tutoring of application software. The key media combination was audio and application sharing.

THE TECHNOLOGY'S HERE BUT HOW MANY CAN USE IT?

The 1997 Web course employed NetMeeting. Out of 15 participants, only two felt confident enough to install and use it. One, a primary teacher in the nearby city of Timaru, even went as far as to provide a demonstration of remote tuition for a group of Primary school teachers at an Otago Polytechnic seminar using the whiteboard and a computer literate six-year old.

It is unfair to be critical of the participants. By Bill Gates' admission, sound is a poorly integrated part of the Windows operating system and it's awkward for new users to manage. Many contemporary computers still don't have good microphone input stages and deliver poor quality transmissions.

Technically, NetMeeting worked well. Data transfer rates above $16kbs^{-1}$ gave usable sound although congestion was and still is an issue, manifesting itself as breaks in reception.

The feedback from the 1997 courses was illuminating. CD publication used cheap media but a slow CD writer added considerably to the final cost. It also offered functions well in advance of traditional paper media. However, it wasn't popular. Most participants wanted a book so they could work at their leisure away from the computer.

ARE OLD HABITS AND SKILLS TRANSFERRABLE?

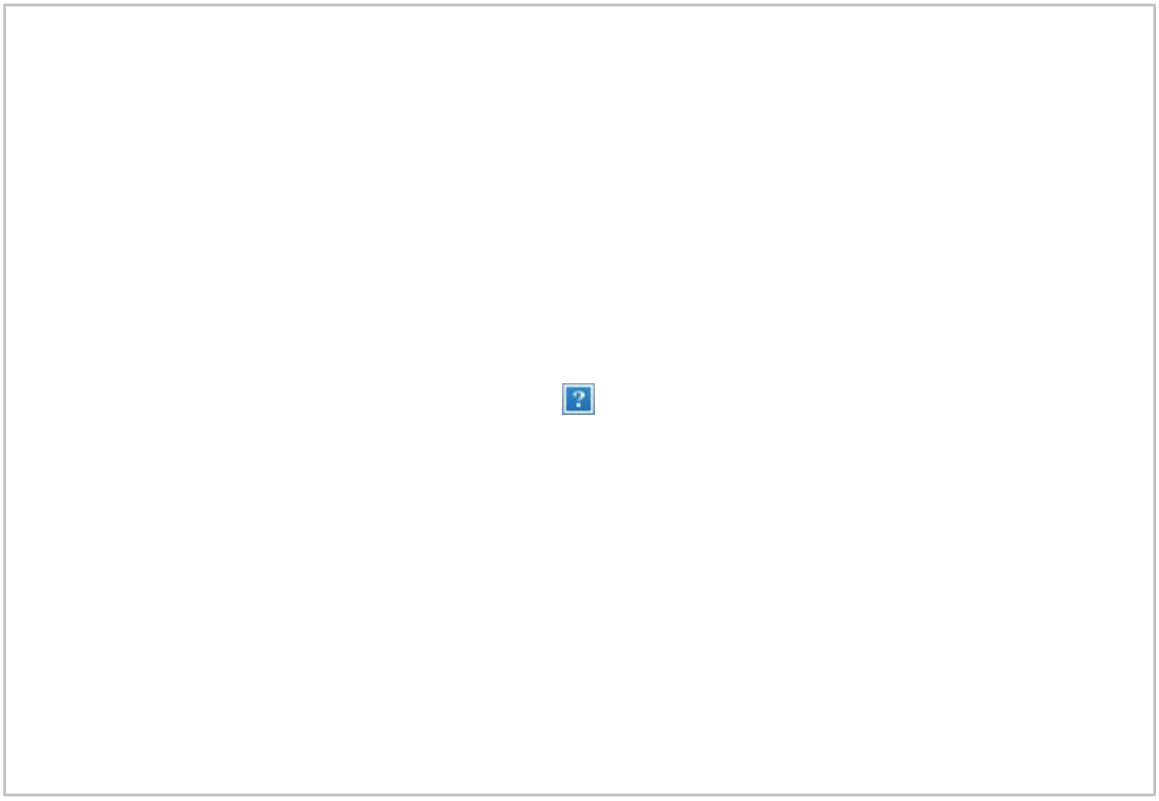
The 1998 Web course included a book echoing the CDROM's textual and image content but, of course minus the links which were presented as footnotes.

Measured by the important yardstick of client support, the 1998 course still did not rate as a great success. Participant feedback indicated little fault with either technology (with the exception of the continual bandwidth problem) or content but rather with the somewhat less tractable but vastly important issues of prior learning, technology access, available time for study, motivation and cost.

Investigation also showed text chat to be still as unsatisfactory as ever for many participants as an electronic classroom medium. Humans were really designed for speech.

COMPLETING THE INFRASTRUCTURE

During 1998, two further key technologies approached maturity. They were key technologies because, like application sharing, they increase the completeness of interaction between tutor and students.



Placing tutor and students at a distance immediately breaks the complex interactions possible within a classroom; it is argued here the prime purpose of networked learning technology is to mend that break.

The first technology was streaming, event driven media in the form of rival technologies from Microsoft and Real Networks. The Microsoft offering which evolved from the original NetShow through NetTheatre to WindowsMedia was attractive as it was a free additional, component of the Windows operating system.

It delivered a live (synchronous) or recorded (asynchronous) audio-visual media stream accompanied by events capable, for example, of changing the contents of a Web frame. A typical implementation would have media player running in one frame of a multiframe display. Successive events caused the updating of the contents of the other frames.

The second was multi-point data-conferencing. The unsatisfactory nature of text chat has been noted earlier. NetMeeting provided most of the essential features for creating a virtual classroom except that, without the support of an MCU, it was incapable of multi-point connection.

Internet based Multi-point Conference Unit (MCU) servers with floor-management software promised true electronic classrooms being able, as they were, to connect multiple NetMeeting or H.323 clients. Trials with White Pine's MCU were promising but constrained by the huge cost of licenses, well beyond the purchasing power of the Polytechnic, and by the advanced firewall requirements of the connection technology.

It is only recently (2001) that products such as Lotus SameTime have removed both the cost and technological barrier to respectively affordable and effective implementation.

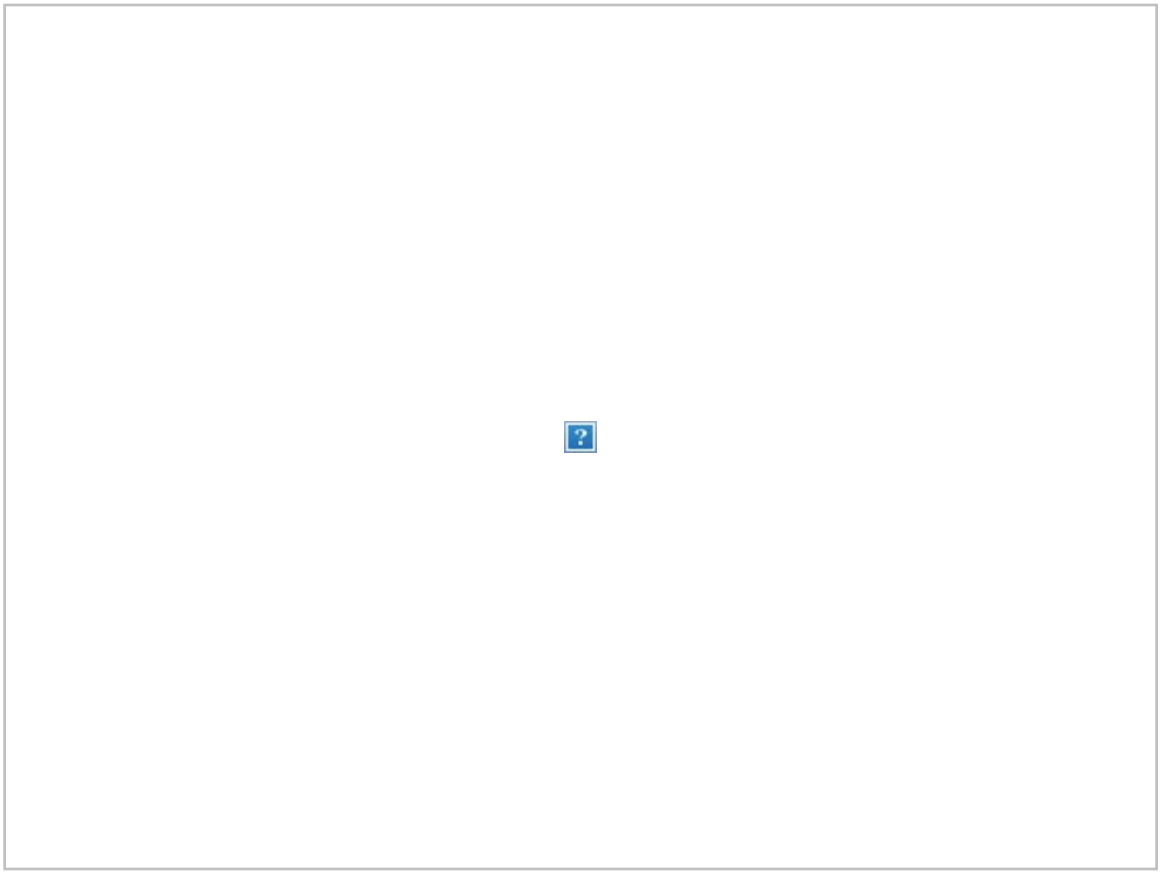
INTERNET OTAGO – AN INTEGRATED NETWORKED LEARNING SYSTEM

1998 began an initiative to solve the problem of ICT teacher professional development in the Otago region. With around two hundred schools, many of them quite small, scattered over a wide area, the traditional approach of transporting people to an urban centre for training was inapplicable because of the numbers of people and the distances involved; the amount of training required was also considerable.

It was clear emerging technologies might lend themselves to a solution but a sensible mix had to be applied coupled with a ramp-up strategy which would help Otago teachers to become ICT self-learners. In addition to the variety of difficulties noted earlier, it was evident in discussions with teachers that there was a self-confessed fear of ICT allied in many cases with a healthy cynicism of its true classroom worth.

A two-tier strategy was devised. The lower tier delivered basic ICT skills through tutor contact with the general of aim of providing both confidence and expertise sufficient to allow further development through the networked learning environment which comprised the upper tier. The overwhelming majority of the potential participants had few or little ICT skills and the strategy's first tier was an essential pre-requisite to use the networked learning environment.

The lower tier allowed a choice between a teacher only and a classroom based environment.



The latter was intended to fulfil a number of educationally critical purposes including the direct transfer of ICT skills to the classroom, to demonstrate the curricular relevance of content and approach and to develop confidence and a sense of perspective in using ICT.

The projection tool was an Internet capable multimedia notebook network equipped with printers and a video projector. The network media was always intended to be radio-lan but the cost and poor performance at the time forced the use of standard networking technology.

Fitting into the back of a station wagon and with an assembly time of 5 minutes (wiring left in place) a known and highly capable ICT environment could be placed in any room with a mains supply and a telephone line.

The network was used in both circumstances with great success.

The second tier employed networked learning to build a self-improving, dynamic electronic community.

An ICT technological infrastructure and operating methodology was proposed (Morris, T., 1998):

> Initial development and classes in specialised ICT areas: mobile, internet capable, radio-LAN, notebook network.
>
> Synchronous and asynchronous delivery of learning materials: Web, event driven, streaming media (files and meta-files), CDROM, screencapture/replay software, traditional texts and e-texts, e.g., Acrobat.
>
> Synchronous and asynchronous communications: H.323 clients, e.g., NetMeeting supported by MCU, e-mail and mail list-servers, telephone and fax.

Value-added self-improvement capability: the free and redoubtable AOLPress Web editor supported by AOLServer 2.3.3. The system supplies easy remote Web account and personal site maintenance with high security and provides a medium for participants to publish ideas, suggestions, lesson materials in tandem with mailing list notification. In so doing, it was hoped part of the outcome would have been a bootstrapping of teachers' own ICT development, reflecting similar approaches from other members of the educational community (Spohrer, J., 2000)

Continuous online support: the wealth of knowledge in the local community, including that of schoolchildren was to be tapped through the use of mailing list services and knowledgebases with individual help delivered through dataconferencing.

THE EDUCATIONAL HINTERLAND AND THE DEMISE OF INTERNET OTAGO

The Internet Otago strategy was strongly dependent upon emergent technologies and a radically different approach to professional development. For example, wherever it was sensible to do so, delivery followed that of the generalised view of the New Zealand Technology Curriculum which espouses JIT (Just In Time) learning as opposed to JIC (Just In Case) with the motivational aspect considered of immense value.

It won widespread acceptance within Otago schools and elements of the infrastructure were put in place in 1999. However, a change in perspective by Otago Polytechnic and a failure to capture the support of other parties despite its considerable cost-effectiveness meant the system was closed at the end of that year.

An independent OSTEC (Otago Schools' Technology Education Centre) continues with the development of the Internet Otago concept and efforts continue to find financial support.

BIT AND VIRTUAL COURSE EXPANSION

Much of the infrastructure developed for Internet Otago has been recently revisited because of the continuing growth of the BIT course. Otago Polytechnic, in common with many other institutions, has limited space for physical expansion. Its courses have also attracted considerable interest overseas as well as in the rest of New Zealand.

The limited trial of the Internet Otago system appeared well suited to the requirements of networked learning, especially in the light of the increased functionality and reduced costs for key services such H.323 multi-point data conferencing and its application is under review for use during this academic year. It is worth noting the general success of Internet Otago (Morris, T., 2000) closely follows the experiences of others working with similar systems (Goodyear, P., 1994).

REFERENCES

Goodyear, P. (1994) Asynchronous peer interaction in distance education: the evolution of goals, practices and technology (Draft). *CSALT/Department of Educational Research, Lancaster University, England*, 6-12.

Morris, T. (1998) http://ostec.earthlight.co.nz/dunbackschool, *Otago Schools' Technology Education Centre*, (entire site).

Morris, T. (1998) Internet Otago. *Otago Polytechnic*, (entire document).

Morris, T. (2000) Electronic and control technology in schools. *Otago Polytechnic*, (entire document).

Spohrer, J. (2000) The Meaning of Learning in the Perspective of Rapid Technological Change. *Presidential Session at AECT Denver*, 1.