

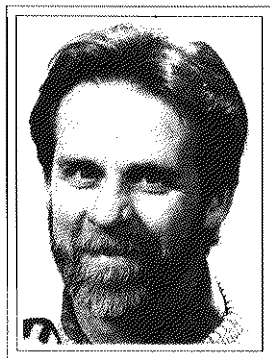
CONNECTING SCHOOLS TO GLOBAL NETWORKS: CURRICULUM OPTION OR NATIONAL IMPERATIVE?

BY MICHELLE WILLIAMS
Queensland University of Technology

CHRIS BIGUM
Deakin University



Michelle Williams lectures in the School of Mathematics, Science and Technology Education at Queensland University of Technology (Kelvin Grove). She has contributed for many years to the study of information technology in secondary schools. In recent years her research interests are in telecommunications in education and is working closely with the Ipswich City Council's Global InfoLinks project.



Chris Bigum is Senior Lecturer, Faculty of Education, Deakin University, Geelong, Victoria. He is currently interested in working on: education in postmodern conditions, non-linear dynamics, self-organising systems, cyberspace, the Nintendo generation. His hobbies include bodysurfing, swimming, photography, attending electronic salons and apprentice parenting.

BETWEEN HYPE AND HAPPENING

The term 'Information Superhighway' enjoys much public prominence but is also the basis of confusion for teachers and the Australian public generally. In Australia at present there is no information superhighway. There is much debate about what it might be, how it might be used and who might pay for it. The term appears in most television programs concerned with computers. It appears in debates about cable television and depending upon who is talking, it can mean satellite configurations for broadcasting hundreds of television channels, copper and glass cable that will connect most Australian homes, a microwave communication network or any combination of these. The debates about infrastructure have been more prominent than debates about what we might do with such communication infrastructure were it put in place. Here too the claims concerning how it might be used and its potential benefits are as varied as the hardware proposals. The term is used to gesture towards an imminent transformation of education. It is used to point to the home as a future, key off-ramp for the flood of information that will one day pass along the highway including video on demand, hundreds of pay television channels and home shopping. Globally, it is a symbol of an imminent threat to Australia's cultural identity, by virtue of it carrying an imagined flood of cultural content from overseas¹. In short, it has become something of a high technology incantation that can be used in education, media or policy debates about communication infrastructure to refer to almost anything that has to do with the electronic delivery of information. Like all new technologies it has to find a problem for which it can be a solution or, failing that, invent one. The hyperbole that accompanies such developments is a necessary part of the social acceptance of a new technology and needs to be seen as representing the largely imagined views of

promoters and enthusiasts. All we can be sure of is that whatever we end up using any new communication technology for, is notoriously difficult to predict (Sproull and Kiesler 1991).

Broadcast television has been an increasingly important technology in delivering information to us and one of the foci of the superhighway debate is concerned with the future of pay television and the infrastructure that will be needed to support it². These debates have been concerned with various proposals for broadband systems, for instance the superhighway made of glass and copper that would connect every home at an estimated cost of ten billion dollars. With the exception of this most expensive option, the information superhighway envisaged in these debates carries information flowing largely in one direction much as it does now with broadcast television. The services it will support will be dubbed interactive, like some of the recently established satellite services to schools where the level of interactivity is not likely to be much more than can be obtained on talk-back radio.

The other debates seen by schools as more important, are the debates about an existing global computer network, the Internet. Unlike television, this network supports a high degree of interactivity in which users exchange information with other users all around the globe in an increasing variety of ways. The Australian section of Internet, AARNet³ is a modest set of links connecting Australia's universities, TAFE colleges, some schools and a collection of commercial and government users. It could not be called an information superhighway in data terms. It is more like a country road. AARNet provides access to the Internet via a narrow data bridge across the Pacific.

The Internet is the term given to a world-wide network of computer networks that use a common communications protocol, TCP/IP

(Transmission Control Protocol/Internet Protocol). It began in the late 1960's as a means of providing communications between universities and high-tech defence contractors in the U.S. It has grown from those military beginnings to a point where there are now an estimated thirty million users and over three million hosts supporting communication for a wide range of purposes. The growth of the Internet is difficult to assess except that it is fast and is the subject of regular reporting⁴. The community of Internet users are important for the educational model they generally support. Much of the information and help on the net is available without charge although the Internet itself costs to operate. There is a helping ethos on 'the net' in which people are more than willing to help and support one another, often sharing highly specialised information and understandings and almost always without charge. Recently, these circumstances have begun to change as commercial services on the Internet develop.

As it is currently constituted, the Internet offers a diversity and richness of information that alone makes it a legitimate focus of considerable interest for scholars and teachers, particularly those concerned with teaching with and about the new information and communications technologies. This issue of the journal, conferences of State Computer Education Groups (CEGs) and activities within the professional development program of CEGs are indications of the growing interest of Australian teachers and schools in the Internet. Seemingly unrelated and clearly of less interest are the other information superhighway debates, those concerned with broadband delivery. Yet, as will be argued, it is important educationally to connect the two sets of debates not only as a way of providing a broader rationale for networking schools but also to engage schools in the important debates concerned with the information superhighway, our cultural identity and Australia's place in a new global economy.

The deregulation of our economy in the mid 1980's and participation in global finance markets was the first of two deregulations which mark Australia's engagement with the two driving influences of global information systems: finance and electronic entertainment (Schwartz cited in Brand,

1987, pp 230-231). The second and arguably more important deregulation is yet to occur. Our participation in a global exchange of cultural products, primarily in terms of television programs, is regulated at present. It is unlikely that the protection we have in place will survive many more rounds of the General Agreement on Tariffs and Trade negotiations. The current exposure of foreign media is only a harbinger of what is to come as national barriers and boundaries give way to a proliferation of delivery of entertainment into Australia via global computer and communication networks. Be it television, film, information or edutainment, the convergence of computing and communications technologies and the proliferation of sites for delivery will increasingly challenge previously accepted understandings of what it is to be an Australian and what Australian society is. These large questions are the mainstay of Australia's education agenda. The rapid emergence of global, converging technologies and their cultural and economic significance poses an urgent and crucial question: what educational agenda is possible in Australia in this new context?

These concerns seem far removed from the day-to-day concerns of teachers and schools. This paper seeks to bring together these local concerns and interests of accessing the Internet and the considerations that derive from the use of global computer networks in reshaping the economic and cultural agenda of Australia. In doing so it aims to set out a basis for thinking about these changes, thereby enabling policy developments in schools concerned with the Internet to be more broadly based than those that have so far informed the use of telecommunications in schools. The paper argues the importance for networking Australia's schools that goes beyond the usual vendor-driven opportunism that has largely characterised the development of computing in Australian schools. The argument is developed through an account of the history of computing and telecommunications in schools and an analysis of the current range of options for Internet access that schools have. A brief account of the influences of the changed circumstances schools now experience as a consequence of global computer networks being employed for financial and cultural exchange, is

used to argue that schools need to locate their concerns about Internet access within a larger frame so that they become active participants in shaping the educational agendas that are emerging. Such a position would support the preparation of a future, citizenry skilled and knowledgeable about the new global contexts that have developed. The alternative, to remain as uncritical, passive consumers of the new products and services associated with the information superhighway would prepare future citizens similarly. The problem for schools is therefore to act locally but think more globally about the changed and changing circumstances that Australia faces. In this way local, school-based curriculum development can be informed by and articulated with national concerns about cultural identity and the preparation of the next generation of Australian citizens.

WHEN THE PAST RUNS INTO THE FUTURE

Using telecommunications to connect to remote computers is not new to Australia's schools. In the early 1980's long before there was any talk of information superhighways, a small but energetic group of teachers succeeded in adding telecomputing⁵ to the curriculum of some schools. They made use of telephone lines and commercially available electronic mail systems to connect schools in Australia to schools in Alaska and elsewhere. The significant achievements in this decade of telecomputing in Australian schools came through the energies of enthusiastic and determined teachers rather than from organised planning by state education systems or government funded national initiatives (Williams, 1994). Typical of this grass roots style of development was Malcolm Beazley's Computer Pals Across the World Network (Beazley & Erwin, 1988; King, 1990). It developed outside any education system's program of support and became a major influence on the development of the curriculum-based telecomputing that followed.

Another important example of grass roots development of telecomputing is the Australian Telecommunications Calendar which began as a result of shared interests of regional level computer education advisers and ended up becoming a national clearinghouse for curriculum projects as well as a focus for the

professional development of teachers (Williams & Green, 1991). Its continuing presence makes it a valuable and the only nationally coordinated curriculum resource in telecomputing for teachers.

The mid 1980s saw the appearance of a number of national and state programs for funding computer education activities in schools. The increase in telecomputing activity during the mid and late eighties is largely due to this funding which allowed some school systems to organise electronic mail and information services for schools. Payment of system-wide subscriptions (for example, Keylink) or development of state level networks (Nexus and Tasnet) were mechanisms which helped schools avoid the costs of individual subscriptions and time-based charging. Dealing with commercial providers in this way suited schools as well as the providers who were used to marketing to large organisations rather than to small numbers of schools or individual teachers. These arrangements at state or system level were typically established so there was a mechanism for local distribution of accounts and local management.

By the end of the 1980s there was continuing telecomputing in schools with a small but scattered group of teachers who continued to explore curriculum possibilities for themselves and their students. State level support and coordination which had all but disappeared by now had provided valuable management and coordination experience for a number of teachers. In a period of reduced funding for schools, time and volume-based charging discouraged many schools. The National Telecommunications Calendar continued to operate and support a range of innovative curriculum activities. Around this time a number of school systems developed computer networks. These systems, generally implemented to support administrative work, did not allow teachers in one system to easily communicate with teachers in other school systems. They offered little or no access to global networks like Internet. Although some mail transfer patches emerged late in the decade, teachers on one system were generally unable to access the information resources, bulletin boards, databases and mail lists on other systems. Ironically, telecomputing became the means of separating the small pool of Australia's telecomputing teachers.

CHANGING TELECOMPUTING OPTIONS FOR SCHOOLS

The influences which shaped school's telecomputing in the 1980s are being reproduced in the 1990s as new options for schools emerge. Grassroots demands by teachers and their collective energies rather than careful planning from school systems are once again shaping market options and educational initiatives for telecomputing in Australia's schools.

The early 1990s was a period in which teachers and schools became more aware of the telecomputing options available on AARNet and through it, Internet. As a result, teachers began to demand more from commercially available and state developed telecomputing services. They expressed discontent with email-based telecomputing restricted to small user communities and with limited information archives and bulletin boards. The Internet was seen as a significant telecomputing resource, not only because of its vast information resources and large number of users but because it appeared to be 'free' to its users⁶. The increasing interest in the Internet by teachers meant that other telecomputing services had to provide some kind of access to the Internet as a means of maintaining their customers.

As a result of these pressures there are now a number of ways for schools to obtain access to the Internet. Commercial providers like Oz Email, Nexus and Pegasus and the various community networks: Dialix, Interconnect Australia, BrisNet, Ipana and Fido Net services provide access to the Internet in various ways with widely varying ease of use. Universities too, now offer varying levels of Internet access for teachers and schools.

In information highway terms there are now a lot of on-ramps for schools, many of which are dirt roads, bumpy four-wheel drive tracks or trail bike paths. The growth in the number of providers of Internet access has been dramatic in the last year and is likely to continue before there is any market shake out⁷. Schools and school systems can expect many vendors knocking on their doors with this, the next wave of high technology products and services. To put these developments in perspective it is useful to group them in terms of their history of involvement in schools' telecomputing and their approach to Internet access.

The old hands

For many schools the use of currently popular services like Nexus and Keylink will continue to be the only telecomputing options available in the near future. These services are available throughout the country through Austpac which offers access via slow speed modems. The services are viewed favourably by school systems because they offer equitable charging structures to country and city schools. The location of the Australian Telecommunications Calendar activities on these services will ensure that schools view them favourably and continue some affiliation in the immediate future at least.

The long term future of these services is difficult to predict. The relatively difficult command driven interface of Keylink together with its decreasing user base, difficult Internet mail delivery mechanism and limited bulletin board system are unlikely to continue to appeal to a user base which is being offered point and click access by other vendors. Nexus is likely to sustain some popularity because of the increasing information services, options and more recently, Internet access that it offers. Nexus is currently an attractive option for schools outside metropolitan areas wanting Internet access.

These 'old hands' have a history of good relationships with schools and school systems because they were largely shaped by teachers and regional advisers, resulting in grass-roots-built systems which matched well the ways schools operated. Customising of telecommunications networks or building of networks gave school systems control over the management structures and gave service providers a base from which to build policy and procedures to direct school level activity. This approach to customising telecomputing for schools had the advantage of providing technical features which supported the way telecomputing is used and managed in schools. For example, local control over the day by day administration of accounts is provided.

In spite of local adaptations, the time-based charging of these telecomputing services makes them unattractive for use in schools. Time-based charging has meant for instance that teachers have not typically used telecomputing for professional development purposes and so there is little online teacher networking in

Australia. Nexus now offers prepaid options for some features in recognition of the pressure from schools for manageable charging structures. Pricing structures are likely to be a major factor in determining which services schools support and how telecomputing is used for curriculum and professional development purposes.

UNIVERSITY AND LIBRARY-BASED OPTIONS

Universities have been providing schools and teachers with access to Internet through community and research projects. In Tasmania, schools have been piggybacked onto the island's library network, effectively giving Internet access to all of Tasmania's schools. Elsewhere there are a number of community based initiatives, a notable instance being the ACT Education Information Network (Denehy 1993) a joint project sponsored by all of ACT's universities⁶. Despite the significance of projects like this to the local community, there is little prospect of Australia's universities expanding their facilities to provide general access to schools. The role of universities in supporting small, community-based local networks is nevertheless significant in exposing teachers to high quality access to Internet services and resources.

A recent survey of Australian universities revealed that the level of formal school use of AARNet via a local university is very low (Williams & Bigum 1994). It also revealed a wide variety of attitudes and policies with respect to supporting local schools in their use of the Internet. This however is changing with some standardisation of the charging mechanisms and access policies across universities. Determined attempts by some universities to offer access to teachers, at least as an interim measure, is likely to result in increased teacher and, in turn, systems knowledge about the Internet and access to it.

University-based access has some problems for novice Internet users. Teachers using university accounts can be confronted with an unfriendly user interface, often lacking software tools and technical support. This kind of environment is unusual for teachers who are used to peer-provided training, documentation, software tools, set up advice and curriculum-based workshops. Universities that offer accounts to teachers do not generally

provide resources to support novice teachers in learning to use the resources of the Internet. The obvious source of support for teacher professional development and curriculum support ought to be Education Faculties but access to and experience of the Internet varies widely from university to university. As the numbers of teachers with Internet experience grows, teacher-driven initiatives have begun to emerge for newcomers. In Queensland, computer using teachers will soon be able to obtain access to the Internet through their professional association. In the absence of system provided access and support, teachers are likely to pursue options of this kind.

Access through most universities has the advantage of an annual charge without time or volume-based charges. These are the circumstances in which academics have developed their skills and knowledge about the Internet and are most conducive to learning about it. For teachers in schools beyond a local telephone call from a university, access is considerable more difficult and expensive. This is an equity problem that universities have not entirely solved for their own students. The recently announced Open Learning Electronic Support Service may provide some universities with an incentive to provide a similar or better service for their remote students, solutions which might offer solutions to some non-metropolitan schools. These considerations are all contingent on larger scale changes which will offer new and likely less expensive options for access to data services like the recently announced Telecom 1-900 service.

There is some prospect for further involvement of universities in networking schools (Williams & Bigum, 1993). There are already moves in a few universities to showcase particular courses for prospective students using World Wide Web (WWW) and to host educational information sites for schools. More generally, there is a growing sense that as a part of a general responsibility to support local communities, universities are currently in a unique position to offer advice and support to schools. However, universities see their current support as an interim solution for schools and expect school systems to eventually undertake responsibility for networking schools.

New kids on the block

Opening up AARNet and the emergence of other IP carriers in Australia has given commercial providers the opportunity to sell Internet access in the general community. New service providers are demonstrating that the precedents in commercial telecommunications services are strong, resulting in time-based charging and multiple tiered pricing for information services, charging structures which schools have always found difficult.

Oz Email is a large Internet service provider marketing to schools using the trade name Ednet through Heinemann Press and Reed Digital. The provider typifies the access 'solutions' rumoured to be soon available through Microsoft, Apple and others. Oz Email is well matched to user needs, taking the best of the popular features of services like CompuServe and community based telecomputing services and packaging them together. Oz Email offers a variety of access speeds, SLIP connections and a number of remarketed Internet options, like OzGopher, OzTelnet and Hyperbase, a form of Internet News. Oz Email has as a service philosophy that users will have a navigable path through its interface to the Internet.

The strength of Oz Email's solution for schools is that it offers a graphical user interface at slow speeds by locating the software on the user's machine which interacts with the remote host for data to fill menus, windows and screens. The Oz Email interface offers an off-line reader, a facility which can minimise on-line costs and suit classroom use. The software works on single machines or on a network. It is possible to imagine that a class of students could add mail messages to the 'Mail out' folder through the day and the software could dial in after hours and deliver and receive the day's mail in preparation for the next school day. Oz Email's Hyperbase system provides users with a number of local and external news groups and file archives, including titles likely to appeal to computer coordinators, computer studies teachers and game collectors. The resources for non-computing curriculum use are thin on the ground and teachers are more likely to find value in the recently available OzTelnet and OzGopher facilities. Oz Email does not offer a customised World Wide Web access but plans to in the near

future. Oz Email has an extremely complex charging structure with charges for time online, character traffic, mail to Internet destinations that are not Oz Email addresses, and also for many of its information services.

CompuServe is a popular service provider which is an experienced provider of telecommunications services to the commercial sector. It has a comprehensive information service, considerable online resources and software collections and has an extensive userbase. CompuServe offers off-line mail software, and a number of information navigation tools to explore CompuServe information sites. CompuServe has not been popular with schools because of its monthly subscription fees, time-based charging and multiple tiered fees for information services.

Commercial services while offering access and interface solutions to schools, fail to address the needs of schools more generally and offer no long term solution to school needs. The time and character-based charging of these services discourage use. Teaching students telecomputing or information seeking skills using these services will prove expensive. Teachers too will be disinclined to use these services to support their professional development which is a pity given its high priority in education policy at present.

Teachers are currently isolated from their peers and from learning opportunities because they spend most of their time working alone in classrooms. The isolation of the teacher becomes reflected in a view of learning as a process which takes place in the minds of students working quietly at their desks. It is difficult to imagine how teachers working alone in their classrooms are going to be able to provide students with a world wide perspective in a rapidly changing world.... If we want teachers to provide students with a global perspective, then it is critically important to find ways of strengthening teacher's links to world events and to global issues. Participation in a network is one way to accomplish this.

(Reil, 1993, p. 222)

The attention given to Oz Email and CompuServe in this paper does not indicate a preference but illustrates the kinds of services that are likely to appear in the next year or so. Given the cost of developing such systems, most services are likely to be derivatives of off the shelf software (Oz Email is similar to CompuServe in design and man-

agement right down to terminology in menus and names of services). Even Keylink was a service minimally adapted from a Canadian source. Like all such services, it will have to make money for its developers. Given the small scale on which most of these services will operate, costs will necessarily remain high for their customers.

A different kind of service targeted directly to schools is schoolsNET. For schools willing to invest in equipment to connect to Internet but which do not have the technical knowledge or university contacts to establish links, schoolsNET provides an option. A company based in Victoria, it has purchased a commercial licence from AARNet for the purposes of connecting schools to the Internet. It focuses on designing high quality ISDN, whole school connections from a server on a school network to schoolsNET's facilities. Individual subscribers are not catered for at present. For a fee, schoolsNET will provide a consultancy to help a school plan its Internet connection and manage the environment after installation. As part of the service, it will provide all hardware, software, line installation and training if required. Charging for the consultancy and installation varies according to school needs. Subscribers are charged an annual fee dependent on the number of users and type of connection. There are no on-line charges for the service, so once connected schools only pay an annual amount.

These services are indicative of a growing number of vendors who see selling access to the resources of the Internet as a significant commercial opportunity. Their enthusiasm to stake a claim in what is imagined to be a rich source of revenue was underlined in a recent conference in Sydney at which a number of would-be suppliers clearly demonstrated they knew little of the Internet and saw the task as merely putting an appropriate interface for schools on the market. Just as there was an equally mad scramble to get microcomputers into schools in the early 1980s, we are likely to see similar attempts with respect to the selling of telecomputing services. The only thing that is certain is that schools will pay for the experiments of many of these entrepreneurs and likely end up with a less than satisfactory experience of what is for many American schools a much less difficult and much less expensive proposition.

Community-based networking

A number of community-based non-profit associations are beginning to appear in the market place. These groups offer opportunities for teachers to gain Internet access in a charging structure that is supportive of novice users. Many of the groups have come from a bulletin board, community-net background and operate with teams of volunteers, using shareware or free client and host software. Some of the organisations have a national focus with dial-in ports in capital cities which telnet through to a host machine. There are few dial-in options outside capital cities, though some extend to seaboard cities like Cairns, Geelong and Newcastle. These organisations discourage commercial users and have codes of ethics and conditions of use which focus on community access to Internet including schools and user groups. The codes and conditions encourage open use of the facility, with no restrictions on services available though frugal use is encouraged to maximise accessibility of the service to users.

Most of these service offer a variety of access options from slow 2400 baud dial up to SLIP access. Some offer permanent SLIP access to small groups or heavy users on donation of a modem, phone line and an installation fee. The charging structures of these organisations reflect their community service ethos. Some are based on an annual charge with no time-based charging and perhaps a fee for storage. Others provide users with a choice of half hour or one hour daily blocks of time for an annual fee. Others have minimal charges as low as a cent per minute. Some of the larger organisations have a charging structure more akin to commercial services with annual subscription fees, monthly charges, on-line and character passing charges, as well as storage and an hierarchical access charging structure.

Community run Internet hosts are often managed by computer enthusiasts with technical support from experienced computer managers with hobbyist interests. The interfaces and services tend to support a technical user base and are not likely to be attractive to teachers who have little desire to navigate a command line interface or match wits with an operating system. Most services only offer mail, FTP and Telnet with some offering Gopher access. WWW access and mail readers with a graphical user

interface are rare. These services host user groups and computer clubs, so a good deal of local support is often available. Some community hosts are heavily used and access may be difficult in the evenings, though this may not affect school access during the day.

OPTIONS AND EQUITY

From this account there appears to be many options and opportunities currently available to schools for Internet access. In practice some schools, particularly those remote from large cities will have few options available to them. As has always been the case with the use of the new information and communication technologies in schools equity of access between and within schools will remain a serious and ongoing problem (Morrow 1994). In an equity sense all that this new element in schools computing does is extend the line along which schools might be positioned in terms of high technology resources. Some schools will buy their way onto the Internet as some already have. Others will continue to struggle to find sufficient computers for classroom purposes.

For all schools the cost of access, as we have argued above, will be a prime consideration. Competition between vendors suggests that prices will be kept low but countering this is the small client base that most service providers will be able to attract making services more expensive in the short term. More providers are likely to enter the marketplace over the next few years giving some schools a choice of services similar to that which they had in the early 1980s in terms of microcomputer choice. Like the 1980s the choices are likely to be confusing to schools. Unlike the 1980s schools will be able to replace one service with another more easily than they could swap microcomputer brands. But no matter how vigorous the market and how wide the choice of access options to schools, this additional technology will only exacerbate the current differences in high technology resources between schools:

them that has, gets ... if a particular race, sex or economic group occupies an inferior position in society, you only have to be able to add one and one to see that technology will compound the problem.

(Lipkin cited in Zakariya, 1984, p. 29)

In the 1990s, equity considerations for schools are not bounded by what

schools are able to offer. Unlike the 1980s when schools were relatively speaking, technology rich sites compared to other places in the community, they are now relatively poor sites⁹. As microcomputers become more commonplace in homes the difference in access to computers between home and school will increase. As the Internet takes on more educational significance in the minds of parents, some children, as they do with microcomputers, will have better access to the Internet in their homes than at school. These developments underline the importance of keeping equity at the forefront of the debates about an information superhighway and education. Equally, schools will need to become much more astute than they were in the 1980s in the way that they manage these new developments. It will make little sense to replicate services that are in most homes. Finding a pathway in this new, complex and rapidly changing educational landscape is and will continue to be difficult. It will be made more difficult if the issues are seen as local curriculum problems having little to do with the changed and changing circumstances that Australia faces.

COMING TO TERMS WITH A NETWORKED WORLD

The converging technologies that have enabled global networks like the Internet to develop are also implicated in much broader social, economic and cultural change. The proliferation of global transmission of information, be it money, entertainment or any of the many other forms of digital data that are now so easily moved around the world has created a changed set of circumstances for Australian society. One way of looking at the changes that have developed from the use of global information flows is to imagine that a new kind of geography, one that is largely independent of the constraints of time and space has been laid over existing geographies of buildings, roads and national boundaries (Wark, 1993). Australia, like other countries, is still coming to grips with what it means. Over a decade ago Australia had its first experience of a new global, digital world when it deregulated its economy. The effects of this decision continue to work their way through most elements of our society. Unlike money, access to global electronic entertainment into Australia is regulated at present.

Whatever form the information superhighway takes, it will eventually carry content in such volume that many believe our culture and many of our culture industries will be threatened. The implications for education, for the production of citizens, for the maintenance of an Australian culture are profound.

Our schools are ill-prepared and ill-equipped for these changes. Schools already experience the changed circumstances (Bigum et al., 1994). There is reduced and reducing funding from the state and the intermediate management and support structures upon which schools had become dependent have been all but removed in most school systems. Castells (1991) and others point to the winding back of the state's role in supporting health, education and welfare being associated with the growth of a high speed, global economy. The push to diminish or privatise public schooling (represented as inefficient and ineffective¹⁰) is a now well underway in many schools systems around Australia. Further, as Australia moves to adjust its economic performance to the requirements of a more competitive global economy, schools are redefined as a part of national economic infrastructure, making them subject to the same reform pressures as other 'industries'. Making schools more efficient, a euphemism for cutting resources, is justified in terms of national economic restructuring.

Another influence on schools comes from the increased competitive pressures on business in a deregulated, global economy. To survive, a business has to either expand existing markets or find new ones. Marketing experts report that those who attend schools are influential in shaping markets outside schools (In the US, Business week report that 4-12 year olds influence \$132 billion worth of purchases each year). This has come to be reflected in the weekly mail that passes over a principal's desk in which there are offers to participate in promotions, schemes to raise money, obtain computers, and schemes to help improve the 'selling' of the school to 'clients' (Collier & Tregenza, 1994). Schools have become important sites in terms of the marketing of products. Many of these products are those of global multinationals who trial promotion schemes in one country and then apply the same scheme around the globe¹¹. Schools are seen as an

untapped and undeveloped market and considerable effort is going into converting schools into places where products can be sold and promoted¹². Schools currently find sophisticated curriculum materials being supplied to them by special interest groups in Australia. In the United States it has gone up a step further. There are specialist companies who will design curriculum materials which promote particular industry points of view, interests and products.

A third influence on schools is the growth in the global delivery of *infotainment* and eventually, *edutainment*. Perhaps more than any other development, the mass electronic media pose the most immediate as well as long-term challenge to schools, classrooms and the formation of Australian citizens. Schools are inventions of the industrial age, *constituted* largely through print. Their prospects in a world *reconstituted* by global communication of image and information is uncertain (Hinkson, 1991). The education and information activity of communication networks does not replace the older education and information activity in schools any more than manufacturing and industry replaced agrarian activity. Digital information flows *lay over* the material flows and practices of schooling. What is unclear is the nature and extent of the articulations. Hinkson (1991) argues for instance, that the mass electronic media have already replaced schools as the principal socialising influence for students. Further diminishing of the traditional roles of schools and classrooms loom. As the home, the car and the person are increasingly targeted as important sites to connect to a global information grid, schools and their classrooms may become spaces which are, relatively speaking, media-free (Bigum & Green, 1993).

These considerations because of their scale and differential articulation to schools are difficult to engage. Ignoring them constrains current attempts to network Australian schools to a narrow, technical focus in which the Internet is merely one of a number of high technology educational resources available to schools. The Internet is the only significant global computer network to which schools can connect. It is the only means by which students and teachers can obtain *interactive* experience of a global network compared to the *reactive*

experiences of other media forms and networks. At a time when global computer networks support a range of economic and cultural activities that pose significant challenges and problems for schools it would seem extremely unwise to ignore an opportunity to develop skills and understandings that pertain to an increasingly networked world. But access is only the first step in articulating schools and other educational institutions to a world in which knowledge has become the key commodity.

The basic economic resource — 'the means of production' to use the economist's term — is no longer capital, nor natural resources (the economist's 'land'), nor 'labor'. It is and will be knowledge. The central wealth-creating activities will be neither the allocation of capital to productive uses nor 'labor'. ... Value is now created by 'productivity' and 'innovation', both applications of knowledge to work.

(Drucker, 1993, p. 7)

Schools are and always have been 'knowledge industries' but they continue to reflect their industrial revolution origins in the way they produce and distribute knowledge. Depriving schools of access to new forms of production and dissemination of information is an effective way of consigning schools to a reactive, uninformed consumer role rather than that of an informed, proactive player capable of shaping the development of new educational practices.

In this respect, recent policy initiatives for the professional development of teachers is an important development. The National Professional Development Project expresses a concern about the capacity of teachers to adapt to the new demands of preparing appropriately skilled citizens. To understand the problem solely in terms of upgrading this group of knowledge workers (teachers) while at the same time not giving them the means to participate in the new ways of working with information networks underlines a serious policy uncertainty.

Policy about the new information and communication technologies in education and in most other parts of Australian society have been typically reactive. Large sums of money are typically expended with little purpose or vision beyond the first level claims made by the proponents of the technology. Sproull and Kiesler (1991) point out that first level effects, the claims made on behalf of the new

information and communications technologies in order to justify their acquisition, are rarely evaluated. The significant outcomes (second level effects) are those that arise as a result of implementing the new technology. They arise because 'people pay attention to different things, have contact with different people, and depend on one another differently' (Sproull & Kiesler, 1991, p. 4). New technologies begin their lives as solutions in search of problems and undergo reinvention when they are implemented. To imagine otherwise is naïve. A capacity to uncritically consume each new wave of high technology products is not a sound basis for policy. Unfortunately, there is a significant lacunae in the study of the cultural and social outcomes of using new information and communication technologies in Australian education.

By arguing for the connection of the problem of Internet access for schools to broader social and cultural issues we reject the view that coming to terms with the new opportunities for Internet access is simply a matter of more of the same approach to computing in schools. The problems and issues that characterised the adoption of computers into schools in the 1980s (Bigum et al. 1987) are still evident in large part today. As the issue of networking schools gathers momentum it is important to go back and attend to the mistakes that were made in the 1980s, the most obvious of which was the insufficient resources given to the support and professional development of teachers. It is an important task and unlike the 1980s the stakes are now considerably higher. In the 1980s many schools were rushed into acquiring computers. It is important for schools not to be rushed into paying for access to the Internet without carefully ensuring there is adequate internal or good local support. As was the case with microcomputer selling, some of the service vendors know little about what they are selling as evidenced by the 'we-know-what-is-best-for-you' front ends. If access can be negotiated through a local university for a reasonable rate then that may be a preferred interim step. There are a number of experienced teachers and users in most states who are better sources of advice than some service vendors.

Given the eventual implementation of some form of access to the

Internet for most Australian schools, it is important for schools to provide early opportunities for staff and in particular senior staff to use it. If the agenda in schools is set by technical considerations then the opportunities¹³ for schools that could flow from being networked will be lost. Schools that do not take seriously the need to provide appropriate professional development for their staff ahead of providing access for students will reproduce the patterns of computer use that have been in schools for the past fifteen years. A national network of schools would mean the loss of existing geographic and school boundaries. It would support new forms of professional development and co-operation between teachers and schools in Australia and elsewhere. It would enable a practical exploration of educational possibilities in a networked world. The educational, social and cultural problems that are in prospect as global information flows increase and proliferate are immense. Keeping schools from this arena of human endeavour makes no sense and marks Australia as a most unclever country, one incapable of providing schools with the opportunity to investigate what educational agenda is possible in the context of global converging technologies.

ENDNOTES

- ¹ The recently released cultural policy, Creative Nation is in part based on this logic.
- ² An excellent analysis of costs for a range of delivery technologies is reported in a publication from the Communications Futures Project of the Commonwealth Bureau of Transport and Communications Economics. Work in Progress Paper #5 is titled 'Costing New Residential Communications Networks'.
- ³ Australian Academic Research Network.
- ⁴ The URL (universal resource locator) for the Internet Index is <http://www.openmarket.com/info/internet-index/current.html>.
- ⁵ A term coined by Butler (1990).
- ⁶ The cost of using AARNet and the Internet via it, is far from free for universities but the charging mechanism allows university academics to be relatively unconcerned about time and volume of data when using the Internet.
- ⁷ Telecom is rumoured to soon announce a service.

- ⁸ Detailed information about the project is available from the ACTEIN gopher: freenet.actein.edu.au.
- ⁹ A Time-Morgan Poll of July 11 1994 indicates that 32% of households currently have a personal computer.
- ¹⁰ Paperi's (1993) recent book promotes a view of this position.
- ¹¹ The recently discontinued Coles-Apple promotion is an example.
- ¹² This is the subject of an ARC-funded research project at Deakin, *Marketing Education in An Information Age*. Jane Kenway, Lindsay Fitzclarence, Chris Bigum, Janine Collier and Karen Tregenza comprise the research team.
- ¹³ For instance, schools could provide simple, low cost, community-based access to the use of global information systems (Williams & Bigum, 1993) for a variety of users including professional groups.
- ¹⁴ The recently discontinued Coles-Apple promotion is an example.

REFERENCES

Beazley, M. & Erwin, J. (1988). In the Beginning: the birth of the Computer Pals Across the World Project, *First conference of Computer Pals Across the World: Sharing in a global classroom*, Northern Territory: Alice Springs Education Centre, pp. 1-6.

Bigum, C., Fitzclarence, L., Green, B., & Kenway, J. (1994). Connecting schools to global networks one way or another. *Apite 94*, Brisbane, Apite 94 Council, pp.359-366.

Bigum, C., Bonser, S., Evans, P., Groundwater-Smith, S., Grundy, S., Kemmis, S., McKenzie, D., McKinnon, D., O'Connor, M., Straton, R., & Willis, S. (1987). *Coming to terms with computers in schools. Report to the Commonwealth Schools Commission*. Deakin Institute for Studies in Education, Deakin University.

Brand, S. (1987). *The Media Lab. Inventing the future at M.I.T.* New York, Penguin Books.

Butler, G. (1990). A hop, step and a jump into successful telecomputing. *Stepping into the nineties: 1990 CEGQ State Conference*. Brisbane, Computer Education Group of Queensland, pp. 9-12.

Castells, M. (1991). *The Informational City*. Oxford, Basil Blackwell.

Collier, J. & Tregenza, K. (1994). Across the Principal's Desk. *Changing Education*, Vol. 1, No.1, pp.12-13.

Denehy, B. (1993). *Creating the ACT Education Information Network — Programs and Progress*. *Networkshop 93*. Melbourne, University of Melbourne, available from ftp.unimelb.edu.au.

Drucker, P. F. (1993). *Post-capitalist Society*. Oxford, Butterworth-Heinemann.

King, S. (1990). Remote schools in the Northern territory — a Computer Pals initiative, *Third conference of Computer Pals across the world*. Cairns, Cairns College of TAFE, unnumbered pages.

Morrow, A. (1994). Straggling Down the Highway; Technology, Schools & Equity. Paper presented at the *Learning Environment Technology Conference*, Sydney, 25-28th September, Adelaide.

Papert, S. (1993). *The Children's Machine: Rethinking School in the Age of the Computer*. New York, Basic Books.

Reil, M. (1993). Global Education through Learning Circles. In Linda Harasim (Ed.) *Global Networks: computers and international communications*. Cambridge, MA: MIT Press. pp. 221-236.

Sproull, L. & Keisler, S. (1991). *Connections: new ways of working in the network organisation*. Cambridge, MA: MIT Press.

Wark, K. (1993). Suck on this, planet of noise! (version 1.2) in David Bennett (Ed.) *Cultural Studies: Pluralism and Theory*. Parkville, Vic, Dept. of English, University of Melbourne.

Williams, M. (1994). Telecommunications and Australian schools: retrospect and prospect. Paper in *Apite 94*. Brisbane, Apite 94 Council, pp.187-193.

Williams, M. & Green, C. (1991). National Keylink Projects, *ACEC '91 — Navigating the Nineties*. Brisbane, Computer Education Group of Queensland, pp. 332-340.

Williams, M. & Bigum, C. (1993). Opening up access: AARNet and schools in *Networkshop 93*. Melbourne, University of Melbourne, available from ftp.unimelb.edu.au.

Williams, M. & Bigum, C. (1994). Networking Australian schools: preliminaries, problems and promise. Paper in *Apite 94*, Brisbane, Apite 94 Council, pp.195-202.

Zakariya, S.B. (1984). In school (as elsewhere), the rich get computers, the poor get poorer. *American School Board Journal*, March, pp. 29-32. ♦