Net Gains: Does Access Equal Equity?
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Abstract

This article looks at the rhetoric from educational technology proponents who claim that access to information and communication technologies (ICTs) for children in K-12 schools increases equity. The article examines questions such as: What is information equity? Is it possible for all students to have equal access to technology? Does access to information equate with real knowledge? The article argues that we must adopt a critical and informed stance on current policy initiatives, examine ICT technology use in its wide social context, and recognize that both learning activity design and teachers are critical.

Keywords: schools and technology, information equity, access to technology, social context of technology.

Introduction

The promotion of the Internet into the schools and classrooms of elementary and high schools in North America continues unabated. The rhetoric, propagated by politicians and policymakers, industry, and educational 'reformists', has been suffused with utopian visions of what information and communication technologies (ICTs) promise and portend. Consider some of these statements:

"The highway will bring together the best work of countless teachers and authors for everyone to share. Teachers will be able to draw on this material, and students will have the opportunity to explore it interactively. In time, this access will help spread educational and personal opportunities even to students who aren't fortunate enough to enjoy the best schools or the greatest family support. It will encourage a child to make the most of his or her native talents" (Gates, 1995, 185-6).

"We need to recognize that our public schools are low-tech institutions in a high-tech society. The same changes that have brought cataclysmic change to every facet of business can improve the way we teach students and teachers" (IBM chairman Louis Gerstner Jr.at the 1995 National Governors Association meeting, cited in Cuban, October 27, 1996).

"For students to have a successful future, education must relate more closely to the overall direction of society. It is clear that those graduates best able to use computer technology will be the most successful in getting jobs - regardless of the industry or profession they eventually choose. To fulfil its key role in preparing students to be effective citizens of our

technological society, the public school system must keep pace with technological change." (from Technology in British Columbia Public Schools, Report and Action Plan, 1995-2000. URL: http://edub057.educ.gov.bc.ca/actionplan/).

Enthusiasts of Internet technology extol its educational merits. According to education consultant Margaret Riel, on the Internet "students can interact with exhibits at a museum, take a `tour' of the White House, aim a telescope into outer space, or 'visit' cities around the world. They can find electronic penpals (known as 'keypals') or join kids in classrooms around the world to pool data on such common concerns as water quality. They can connect with mentors outside their schools or consult with experts on everything from geology and math to classical music and fine arts. And they can follow along as scientists, explorers, and adventurers mount expeditions to earth's most remote areas" (Riel, 1996, quoted in the Benton Foundation's Learning Connection, 1997).

Technology pundit Don Tapscott dubs the new generation of youth who in 1999 will be between the ages of 2 and 22 as the "Net Generation", or the "N-Generation". "The N-Generation will develop and superimpose its culture on the rest of society. Boomers stand back. Already these kids are learning, playing, communicating, working, and creating communities very differently than their parents. They are a force for social transformation" (Tapscott, 1998, 2).

According to Tapscott, the N-Geners won't just be interested in using digital media as an extension of the television for pure edutainment value: "N-Geners are using digital media for learning. The computers, which populate 60% of American households with children, are used for learning how dolphins give birth and for composing essays on 'my summer vacation'. N-Geners surf the net in teams or alone to do projects or to look up the stats of Wayne Gretsky. Computers have been creeping into classrooms for a decade and teachers are starting to change the way learning occurs, rather than using computers as fancy texts or testing devices" (Ibid, 5).

Some of the general claims surrounding the benefits of ICTs into schools and classrooms include the belief that:

- Children learn better through ICTs.

- Children will be able to explore current issues; networking provides greater access to information.

- Networking leads to an awareness of a global community and a respect for other cultures.

- ICTs encourage collaboration between and amongst students, both within the same classroom or school, or between other (geographically remote) schools

- E-mail encourages writing

- ICTs encourages mentorships with adults who can connect to students outside of the classroom walls

- ICTs help prepare children for the workplace of the future (of which constituent elements

include rapidly changing market conditions, fluidity in the job market, the need for self-direction and participation in collaborative work situations which necessitates learning problem solving and lifelong learning skills)

- ICTs are a necessity for successful educational `reform' (Starr, 1996)

- Access to ICTs for children increases equity.

It is this last claim-that access to ICTs for children increases equity-that will be explored in this paper. Some of the questions that will be asked include: What is information equity? Is it possible for all students to have equal access to technology? Does access to information equate with real knowledge? And, given the frenzied rush to link schools to the Internet, is there a way to sustain and nurture a social infrastructure within the classroom and school after the physical and technical infrastructure has been installed? Throughout these discussions, it is also necessary to adopt a critical and informed stance on current policy initiatives, to examine ICT technology use in its wide social context, and to recognize that both learning activity design and teachers are critical.

Before we embark on a look at equity issues, a very brief synopsis on policy initiatives on ICTs and K-12 schools in the United States and Canada will be given; and then a look at some recent survey results on access to ICTs in Canada.

The Policy Background

In both the United States and Canada, the race is on to see which country can be the most connected nation the fastest. Both countries have adopted aggressive policies and funding programs, and industry has been anxious to get their products (hardware and software) into the schools.

United States:

In the U.S., President Clinton has vowed to connect every classroom and library to the Internet by 2000 and he has asked for $2 billion over the next five years for hardware and software. The Federal Communications Commission (FCC), as part of their E-Rate Universal Service package (which provides discounts for basic and advanced telecommunications to connect schools and libraries) therefore created a $2.25 billion annual fund to defray the cost of Internet connections <http://www.fcc.gov/learnnet/>. The Schools and Libraries Division (SLD) of the Universal Service Administrative Company (USAC) is responsible for administering the telecommunications universal service programs for the Federal Communications Commission <http://www.slcfund.org/>. However, the E-Rate package has come under harsh attack, and in response to political pressures, the FCC has cut the funding to $1.275 billion. Other criticisms over the E-Rate package question the educational benefits of ICTs in the classrooms, while others suggest that the E-Rate package doesn't go far enough - the discounts won't adequately cover the entire cost of maintaining school connections (Center for Media Education, 1999).

Industry has been active through NetDay initiatives. NetDay was initiated a few years ago in Silicon Valley when several high-tech firms decided to volunteer their employees to wire up public schools throughout California. It has now expanded to an international "grassroots volunteer" effort to wire schools so that they can then connect to the Internet. "Our goal is to install all the basic wiring needed to make five classrooms and a library or a computer lab in every school Internet-ready. If the same work were financed by taxpayers, it would cost more than $1,000 per classroom. Volunteers from businesses, education, and the community will acquire all of the equipment and will install and test it at every school site" <http://www.netday.org>. NetDay corporate Board members include representatives from Sun Microsystems, PBS, AT&T, Apple Computer, Cisco Systems, and Philips Magnavox.

Canada:

Canada's Information Highway Advisory Council (IHAC) has bundled the concepts of digital literacy, lifelong learning, economic growth and job creation together as a panacea and/or requisite for pushing their education-technology agenda. In their September, 1997 final report IHAC wrote that "computer and Internet literacy is a necessary precondition for success in the emerging knowledge society and economy. For Canadians able to attend educational institutions, we believe computer and Internet literacy can best be provided by the existing public education system" (IHAC, September 1997, 52).

IHAC also recommended the continuation of funding for SchoolNet, a program of Industry Canada <URL: http://www.schoolnet.ca>. SchoolNet, guided by an advisory board representing industry, government, and educational stakeholders, was started in 1993 in order to connect all of Canada's schools to the 'information highway'. This "new-wave public-private partnership" has spent between $25-35 million in pursuit of this goal (Robertson, 1998, 168-9).

Writing in 1997, IHAC's recommendation 4.14 called for ensuring that "every school in Canada has full Internet access by 1998" (Ibid, 52). At a Government on the Net Conference in Hull, Quebec in April, 1998, Assistant Deputy Minister Michael Binder of Industry Canada championed Industry Canada's 'connectedness' platform: "Connecting Canadians will build a stronger, dynamic Canadian economy; build a Canadian learning culture; build a more cohesive and united Canadian society; and build a stronger democracy through direct citizenship participation". In pursuit of this, SchoolNet is to be expanded from connecting all schools to connecting all classrooms. The Computers for Schools program (which donates used computer equipment to schools) will be expanded to provide over 250,000 computers for every classroom (see Binder, 1998).

SchoolNet's figures indicate that their program has expanded from connecting 0 schools in 1994, to 11,000 in 1997 and an estimated 16,500 schools and 350 First Nation Schools for 1998. SchoolNet boasts that, as of February 1999, "99% of Canadian public schools are connected", with 'connected' school defined as "one with at least one point of access to an Internet service, whether e-mail, FTP or the World Wide Web."

But what we need to ask is: what does `being connected' mean? Connected how and where? Connected to whom? Connected to what sort of content? Connected for what purposes?

Access: Why, For Whom, To What?

"New developments in on-line learning and training technology could lead to access imbalance. Children who can access the Information Highway during their early years could enter the formal school system (itself probably greatly altered) with much greater knowledge than those children from less privileged backgrounds. The power of the Information Highway to teach and offer learning opportunities could actually exacerbate traditional gaps." (IHAC Learning and Training Working Group, 1995).

Access is consistently identified as a key principle in public policy discussions, but it is not an end in itself. Access only enables further activities which can only partially be specified beforehand. There are three main questions to address with respect to access: 1) access for what purpose?; 2) access for whom?; and 3) access to what? (Clement, Shade, 1996, 1998). With the introduction of ICTs into schools, we must also ask and attempt to answer these questions. The next section briefly elaborates on access statistics in North America.

Access Statistics in Canada:

A very brief survey of recent survey findings (adopted from Karim, et.al., 1998) on who has access to ICT technology in Canada will hopefully highlight current trends and show how access is inequitable according to various socioeconomic frameworks. Overall, the figures reveal that even though more people are becoming 'connected' to ICT services, this is a fairly homogeneous group of higher-income families and/or students who have access through universities. What we need to be concerned with are those citizens that are not connected-those in the lower socioeconomic groups, disabled peoples, Native and visible minority people, seniors, and single mothers. As well, it should be mentioned that these surveys do not get into how people use and participate with ICTs. Even though citizens might be 'connected', what good does this do them if they don't use or participate with the services?

Households: Statistics Canada Household Facilities and Equipment Survey from May 1997 revealed that although 36% of Canadian households (4.2M households) have a home computer, only 13% (1.5M households) of Canadian households are connected to the Internet (Statistics Canada, 1997, 3).

Work, School, Home Access: Although most access the Internet from their school or work, the trend is for more Canadians to access it from their home. A 1997 Pollara survey indicated that more Canadians (approximately 65%) were accessing the Internet from their home; approximately 42% from work; approximately 20% from school; approximately 8% from friends; and approximately 7% from the public library (Pollara, 1997).

Access by Province: Internet use and access varies from province to province, with British Columbia (18%) and Alberta and Ontario (15% each) having the highest rates; to those in Prince Edward County, Quebec, and Saskatchewan having the lowest rates (Statistics Canada, 1997).

Access by Language: Given the prevalence of English-language content on the Internet, it is not surprising that Quebec exhibits a low connectivity rate. 76.8% of Internet use by home language is in English, versus 19.9% French and 3.3% other (Nordicity, Neilson, 1996).

Access by Age: Age is another factor impacting access. The highest levels of Internet access are with people in the 25-34 age group (26%) and 35-44 age group (28%). People aged 18-24 are 16% of users, with those aged 45-54 17%. The lowest age groups for access are those in the 55-65 age bracket (5%) and 65+ (1%) (Angus Reid, 1996).

Access by Income: With respect to income and access, it is not surprising that higher income households ($60K+) had 56% access rates; those in the $40-60K range 35%; those between $20-40K, 28%; and those households with income less than $20K at 28% (this figure can best be explained as being populated by university students and recent graduates) (Ekos, 1997).

Access by Education Level: As well, education levels affect access. Of those 25% of the population that have completed university, approximately 55% use the Internet. The 34% of the population that has some university and college education are approximately 50% and 38% of users, respectively; and the 41% of the population who are high school graduates or less have the lowest usage - approximately 27% and 15%(Ekos, 1997).

Access by Gender: With respect to access by gender, 1996 statistics indicated that men account for 61% of users and women 39% (Angus Reid, 1996). Women's access is increasing, and it is anticipated that by 2000, gender use will have reached parity.

Access Equal Equity?

"As information becomes an increasingly important component of the everyday business world, access to information will become an increasingly important measure of equity in society. By networking the nation's classrooms, we can provide the framework for equity of access to information in all schools nationwide. This cannot be done for free; adding a single networked computer to every classroom in the country would cost around $5 billion for the hardware alone. But no other systemic approach to educational equity offers the promise of such great benefits for each dollar invested."(Carlitz, 1994, speaking from the U.S. perspective).

What is the goal of technological equity? Is it to empower all students to achieve personal and academic success and to use ICTs to strive for knowledge and information?

There is a vast literature on computers and equity, according to socioeconomic, gender, handicapped, geographic location and disadvantaged variables. Of these diverse variables, each "has its own problems, research community, and suggested solutions. What the areas share is a need for unremitting attention. Only when all students are routinely granted access to hardware and to appropriate software, and only when technology is used to help each student achieve his or her own personal best, can we speak of technology and equity as partners" (Neuman, 1991).

Equity factors will here be broken down into some of the more recently available data based on socioeconomic, race, and gender variables.

Socioeconomic Elements:

Similar to Canadian statistics and surveys, in the U.S., access to ICTs depends upon socioeconomic status. Access is not distributed randomly and correlates with income and education (Coley, Cradler, and Engel 1997). 82% of high school students from the most affluent homes have access to computers at home, compared to 14 percent of poorer high schools students (Benton Foundation, 1996). In both countries, the higher the family income is, the more likely they are to possess home ownership of computers and modems that connect to the Internet.

Within school districts or boards, inequity can occur between wealthier and less-advantaged districts/boards. In the U.S., 31% of schools with a large proportion of students from poor families have access to the Internet, compared to 62% of schools with higher income students (National Center for Education Statistics, 1996, 3)

According to the Educational Testing Service, "Students at schools with high proportions of poor and minority students have less access to technology than other students do" dispelling the belief that "federal aid has leveled the technological playing field for disadvantaged children". The Department of Education recommends five students to one computer. The ETS report found that in schools with 90% or more minority students, "the ratio is about 30 students per multimedia computer; with schools with minority enrollments of between 24-49%, the ratio is 22-to-1" (ETS, cited in Education Weekly).The report also found a paucity of data indicating whether or not ICTs are educationally effective.

Limited access to hardware and software within schools can also lead to scheduling problems; which selected groups of children get access to computers? Are these the better students (defined in both the academic and social sense)? The physical location of computers can hamper access-are they located in special labs for students enrolled in specific (possibly more advanced/enriched) programs? How do physically handicapped students access computers-are they supplied with adaptive devices, special software, or is the school provided with information about how to adapt regular software?

In July, 1998, the U.S. Department of Commerce released the results of their second study on access to ICTs. The study revealed that, even though more people are becoming connected to the Internet, a persistent 'digital divide' exists, consisting of rural and central city minorities, the rural poor, young households, and female-headed households. According to the report, "the 'digital divide' between certain groups of Americans has increased between 1994 and 1997 so that there is now an even greater disparity in penetration levels among some groups. There is a widening gap, for example, between those at upper and lower income levels" (U.S. Dept. of Commerce, 1998).

Race - The Hoffman/Novak Controversy:

Hoffman and Novak's (1998) study on access to the Internet for African-Americans created a controversy when they reported that "whites are significantly more likely than African-Americans to have a home computer in their household (44.2% vs. 29.0%)....Most notably, whites are significantly more likely (14.7% vs. 9%) to have ever used the Web at home. African-Americans

are more likely to have ever used the Web at school". The reasons for these disparities, according to Hoffman and Novak are that 1) income explains home ownership -- "increasing levels of income correspond to an increased likelihood of owning a home computer, regardless of race"; 2) education explains access to a work computer -- "increasing levels of education correspond to an increased likelihood of work computer access, regardless of race"; 3) Education does not explain race differences in home computer ownership -- "whites are still more likely to own a home computer than African Americans at each and every education level, despite controlling for differences in education". Hoffman and Novak concluded that "race matters to the extent that societal biases have either 1) required African Americans to obtain higher education levels in order to achieve the same income as whites, or 2) resulted in older African Americans not being able to achieve high incomes."

In terms of access for students, Hoffman and Novak found that race matters: "It is strikingly apparent that white students are much more likely than African American students to have used the Web at locations other than home, school or work, regardless of whether there is a computer at home. It is likely that white, but not African American students, are able to take advantage of non-traditional access locations including homes of friends and relatives with home computers, and libraries and community centers with Internet access. Our results suggest strongly that, in terms of students' use of the Web, particularly when students do not have a home computer, race matters."

With respect to how public policy should deal with this issue, Hoffman and Novak recommend that African American students need multiple points of access: libraries, community centers, and other non-traditional points of access.

Gender and Equity:

"Boys are more aggressive when it comes to grabbing space at a classroom computer, and they often fail to share with girl classmates. They are the ones who monopolize the spaces in the school's computer room at lunch and before and after school, and they take more computer courses in high school and college. When boys study computers, they learn to program. When girls study computers, it is often for word processing" (Sadker and Sadker, 1995, 123).

There is also a vast literature on computers and gender (George, 1993; Anderson, et. al., 1994). With respect to young girls, there is a dynamic emerging literature on the gender differences between boys and girls interacting with computer and video games (for instance, see Inkpen, 1997). Researchers have looked at the varying social interactions (collaborative vs. solitary) of boys and girls, as well as issues of video and computer game content. Is it any wonder that girls might not be interested in playing with games with violent and splatter-shoot'em themes? Games such as Battlezone, Resident Evil (Director's Cut), Diddy Kong Racing, and Mortal Kombat resonate more with boys than girls. It is for this reason that there is now a potentially lucrative market in designing games for young girls. And it's not just Barbie's Fashion Designer CD-ROM! Purple's Moon's Rocket series and "Let's Talk About Me!" by Planet.Girl.com are just some of the emerging products attempting to tap into the imagination of young girls.

In October 1998, the American Association for University Women (AAUW) released a report documenting the increasing gap between girls and boys with respect to technology. "Technology is now the new 'boys' club' in our nation's public schools...while boys program and problem solve with computers, girls use computers for word processing, the 1990s version of typing" (AAUW, October 1998).

With gender equity for computers and cyberspace, there is a recognition of the need to actively integrate parents, teachers, and the children themselves into the process of learning about technology, and creating individualistic content (Furger, 1998). One of the more successful programs has been led by Jo Sanders, whose goals for the Computer Equity Expert Project http://www.wri-edu.org/equity/computer.html have been to prepare math, science, and computer teachers in grades 6-12 to integrate gender equity into their classes. Sanders' Teacher Education Mentor Project <URL: http://www.wri-edu.org/equity/temp.html> seeks to institutionalize gender equity in mathematics, science, and technology throughout education departments in university teacher-education programs.

Equity: A Case Study

"While the full extent of the educational component of the NII [National Information Infrastructure] has not yet been defined, there are a few outlines that one can presently discern. Insofar as educational networks are a tool for educational equity, they should probably be deployed so as to reach all classrooms in all schools across the country. This would be an ambitious national undertaking, but one that is realizable in technical terms and affordable in terms of its likely cost/benefit ratio" (Carlitz, Zinga, 1994).

Common Knowledge: Pittsburgh (CK:P) is a research project which is working to develop a "scalable networking infrastructure in support of curricular activities and educational reform". The aim is to put all of Pittsburgh grade-school students online. Originally, CK:P collaboration involved the National Science Foundation (NSF), University of Pittsburgh, Carnegie-Mellon University's Supercomputing Facility, and Pittsburgh Public Schools, but now includes businesses and non-profits (URL: http://info.ckp.edu/ckp.html). Librarians and teachers bid on various Internet-based school projects from the NSF, and CMU's Supercomputing Center provides computer installation and teacher training. Psychologist Janet Shofield is investigating the CK:P project. According to her Internet projects "boost active learning and increase student's access to information--two major tenants of government efforts to reform K-12 education...another plus is student's positive response to the Internet" (Quoted in Murray, 1996). The following analysis comes from a presentation she gave at the ACM Policy `98 Conference in Washington, D.C.<URL: http://www.acm.org/usacm/events/policy98/>

Equity within the Classroom: Classroom level factors that contribute to unequal access are many. Internet use is often seen by teachers as an optional privilege. This view is fostered by: a high ratio of students to access points in a classroom; the lack of routine provision of Internet access points by school districts; Internet use being perceived often as 'enrichment' rather than as an effective way to teach the basic curriculum; and by students' very positive reaction to opportunities for Internet use. This can lead, according to Shofield, unequal access because: Internet access is given as a specific reward for strong academic performance and/or approved

social behavior whereas access is denied as a punishment for disapproved social behavior; access is reserved for stronger students who have mastered the 'core' curriculum. If they don't have much knowledge of the Internet, teachers can contribute to unequal access by letting students who know about access use the Internet (and studies indicate that these students are overwhelmingly white, male, and from a privileged socioeconomic background where home computers are the norm). Classroom inequality also occurs within classrooms between genders; males exhibit more aggressive and competitive behavior towards the Internet than their female peers.

Equity within Schools: Equity issues are many here. Which schools within a school district get connected? (The ones with a higher tax base?) Who within the school gets access? Are there differences? Do children within special programs (i.e., honors and magnet schools) tend to receive more access? Where is the placement of access points within the school? Which children is the access targeting?

Is Equity Possible?

"While many schools have made progress in increasing student access to technology, a troubling picture remains for certain groups of children who are at risk of being left behind, including children in rural areas, disabled children, and low-income children. In addition, girls are too often left behind, in part because most games and software are developed for and marketed to boys. Despite girls' interest in computers in their early years, their involvement tends to drop off by the time they reach high school" (Children's Partnership, 1996).

Modern technology does promote inequality, and the diffusion of the computer illustrates this well. Access to computers favors those that know how to use them effectively. Access to computers and networking also potentially expands a person's grasp of who and what they have access to-what we might call `social capital'. But economist Paul Krugman also makes a speculative argument that, in the long run, as computers take over specialized tasks that so-called `knowledge workers' or `symbolic analysts' are doing, "ordinary work" will become valuable: "those uncommon skills that are rare because they are so unnatural will be largely taken over or made easy by computers, while machines will still be unable to do what every person can. In other words, I predict that the current age of inequality will give way to a golden age of equality" (Krugman, 1997, 203).

Blame the Teacher...

Education historian Larry Cuban (1996) points out how techno-reformers blame the teachers for a lack of widespread use of new technology, even though teachers "remain voiceless in setting the reform agenda.". Cuban blames the techno-refomers: "Maybe their exaggerated claims for what the technology can do, their disregard for the social organization of schools, their ignorance of classroom realities, and their power to frame both the problem and the solution are all parts of why there are so few serious users of these new technologies." There are many reasons for this. First, there is the vaulted opinions of what technology can accomplish and the ideology of the "tech-high" (Moll, 1997).

Second, techno-reformers ignore the realities of classrooms filled with a diverse array of children-both in sheer numbers, and of diverse cultures. Third, is the nature of the social organization of the school- "bell-driven schedules, buses, and public-address systems were made by school boards, not teachers" (Cuban, 1996).

Adopting technology for technology's sake is not a good idea. Thinking through the goals for technology use at the local site involving teachers in the planning process is crucial. This is an important step in ensuring that the technology will be used by those it is intended to support.

Cuban has pointed out (1986) that previous techno-reforms, instituted in the guise of efficiency and innovation, have, like ICTs, been greeted with utopian ideals, but have not worked out to be as wonderful a tool as envisioned. Will this be the same fate as the introduction of ICTs into schools and classrooms?

One of the operative words that has not been shouted loudly is choice-choice for teachers and children in how and why to adopt technology. As well, teachers need more than just training and technical support. Hands-on learning, easy and ready access to equipment, and ideas on how to use technology well in teaching practice and curriculum might make for a sustained use of technology-if this is what is desired.

The Corporatization of ICTs in Schools: Whose Agenda?

There are many corporations aggressively promoting of ICTs in schools. This both promotes the use of specific industry products and ensures that schools will be beholden to these companies for technical support and necessary upgrades.

Some U.S. initiatives include:

Pacific Telesis's Education First program, whose goal is to connect 9,000 Californian schools and libraries by 2000. They promise to provide each library or school with 100 students or more with up to four ISDN lines free of charge; and they also give computers, modems, and multimedia software to the schools and libraries at discounted rate. <URL:http://pomo.kn.pacbell.com/edfirst/>

IBM provides schools with both hardware and software, guarantees them substantial technical assistance, and trains teachers.

MicroSoft projects include participation in the Global Schoolhouse <URL: http://www.gsh.org/>, part of the Global SchoolNet Foundation <URL: http://www.gsn.org/indexlo.html>, a non-profit corporation whose goals are to "harness the power of the Internet" to support various learners within and outside the school environment.

AT&T's $150M Learning Network provides 100 schools with five months of free unlimited Internet access their WorldNet service; schools receive three months of free voicemail service and two years of wireless phone service on school grounds. After the free period, schools receive a discounted service. <URL: http://www.att.com/learningnetwork/>

Canadian Initiatives:

The Province of Ontario's Technology Incentive Partnership Program (TIIP) is giving over $30M in funding for ICT projects in schools with various industry partners including Bell Canada, IBM, Xerox, Royal Bank of Canada, Apple Computer of Canada, Digital Equipment of Canada, etc. Some of the projects include:

> Funding Ontario's Teaching and Learning in the New Millennium ("Link all teachers' computers together through a board-wide network, and generate learning materials that are consistent with the Common Curriculum");

> Hands On IT! ("Equip teachers with the skills, knowledge and tools needed to integrate information technology into teaching and learning");

> Wheels for Minds in Motion ("install computer networks and distance education technology to bring out more educational opportunities");   and one that will "establish a facility to offer students who would otherwise be suspended with alternative technology-based learning programs and opportunity for introspection and self-assessment". (See TIIP Project List at URL: http://www.edu.gov.on.ca/eng/document/nr/96.05/tiplist1.html

Adopting a Critical Stance - What can be a Socially-Driven Technology Agenda?

> "Canadians need to step back and take another look at the agenda to connect all schools to a privately-owned, commercially-driven, resource-consuming information highway. We need to take another look at technologically-driven visions of education and realize that they are financially unsupportable for public institutions. Whenever such ideas are promoted, we ought to insist on supporting evidence for claims of efficiency documenting superior educational outcomes and on a public discussion on who will pay and who will benefit from widespread changes of this nature" (Moll, 1997, 59).

The following are suggestions for beginning to think critically about the technology-school agenda:

1. Establish and monitor equity initiatives in schools, school districts and boards. Create a set of criteria on access: 1) access for what purpose?; 2) access for whom?; and 3) access to what?

2. Design and conduct research on the use and participation of ICTs within schools and classrooms, libraries, and community centres. What alternative public access sites can be created to meet the needs of diverse children and youth? (Resnick and Rusk, 1996).

3. Create a critical perspective on the social and ethical aspects of technology which can be taught to K-12 students. Postman's (1996, 192-3) principles on integrating technology as a core subject in schools is illustrative. He recommends that since technological change is a "Faustian" bargain, we must look at the advantages/disadvantages and intended/unintended consequences of technology. We must look at how technology benefits and harms people differently. We must investigate the philosophies and values embedded in technology. We must determine what old technology a new technology competes with or displaces. We must

realize that technological change is ecological. And lastly, we must become cognizant of the different emotional, intellectual, social, content, and political biases of technologies.

4. When technology is used in classrooms, put the curriculum in charge, not the technology. Organize lessons where the network plays a rational role in supporting learning. Just because it's easy to `point and click', doesn't mean that this is all you can do with computers. Think of intelligent and creative ways to solve problems with technology.

5. Create community with technology and ameliorate the isolation of both students and teachers that can happen with technology.

6. Investigate, through empirical study, whether or not access to information equates with real knowledge. Whose knowledge? How can children escape the commercialization of online media? (Montgomery, 1996). What's a quality media environment? What about information overload? And, how can one assess the `integrity' of the information?

7. Quit blaming the teacher. Consult with teachers on how best, if at all, to integrate technology into their classroom. More than just training and technical support is needed.

8. Insert humanistic values into the technology-education discussion. Should the technology agenda be pushed when public schools face serious challenges, such as physically crumbling infrastructures, increased violence in schools, children coming unprepared to learn because of family poverty, health, or social problems, and overcrowded classrooms? (Children's Partnership, 1996).

9. Question educational reformists (Logan, 1996) who posit that, since work is being changed by our new `knowledge-based economy', our schools must integrate technology with learning in order to train individuals to assume a productive role in society. This is exemplified with NetDay, where techno-reformers in the guise of public officials, corporate leaders, and "other non-educators far removed from classrooms, deeply believe in the power of technology to transform schools into productive workplaces" (Cuban, October 1997).

10. Question and resist the corporatization of education (where computers, corporate partnerships, and privatization are all bundled together). If public education is to remain vital, technology in schools should be publicly supported but not at the expense of other priorities: teachers, librarians, support staff, and books.

Notes

References

American Association for University Women (AAUW). (1998, October). *Gender Gaps: Where Schools Still Fail Our Children* [On-line]. Available: http://www.aauw.org/2000/ggpr.html

Anderson, R. E, et.al. (1994). Equity in Computing. In C. Huff and T. Finholt (Eds.). Social *Issues in Computing: Putting Computing In Its Place* (pp. 352-385). New York, N.Y.: McGraw-Hill.

Angus Reid. Canadians and the Web: Angus Reid Groups; Approach to Understanding this Phenomenon (cited in Karim, et.al., 1998).

Benton Foundation. (1997). *The Learning Connection: Schools in the Information Age* [On-line]. Available: http://www.benton.org/Library/Schools/

Binder, Michael (1998, April 20). *Connecting Canadians: An Agenda for the Knowledge Economy and Society*. Presentation to the Government on the Net 1998, Palais des Congres, Hull, Quebec.

Carlitz, R. D. (1994, February 14). *Network Democracy* [On-line]. Available: http://info.ckp.edu/publications/ articles/democ/democ.html

Carlitz, R. D. and M. Zinga. (1994, January 31). *Creating Common Knowledge: School Networking in an Urban Setting* [On-line]. Available: http://info.ckp.edu/publications/articles/ckp/ckp.html

Center for Media Education. (1999). *Deepening the Digital Divide: The War on Universal Service* [On-line]. Available: http://www.epn.org/cme/ddindex.html

Children's Partnership. (May 1996). *America's Children and the Information Superhighway: An Update* [On-line]. Available: http://www.childrenspartnership.org/bbar/techin.html.

Clement, A. and L. R. Shade. (1996). The Access Rainbow: Conceptualizing Universal Access to the information/communication infrastructure. *Proceedings of INET 96*. The Internet Society; and as an Information Policy Research Program (IPRP) Working Paper No.10, Faculty of Information Studies, University of Toronto, August 1998 [On-line]. Available: http://www.fis.utoronto.ca/research/iprp/dipcii/workpap10.htm

Coley, R. J., Cradler, J., and Engel, P. K. (1997). Computers and Classrooms: The Status of Technology in U.S. Schools. *ETS Policy Information Report*. Princeton, NJ: ETS Policy Information Center. [On-line]. Available: http://www.ets.org/research/pic/compclass.html

Cuban, L. (Sunday, October 27, 1996). Computers in the Classroom: Revolutions that Fizzled. *The Washington Post*, R01 [On-line]. Available: http://www.mecca.org/~ltague/PITTCONF/niiteach.html

Cuban, L. (May 21, 1997). High-Tech Schools and Low-Tech Teaching. *Education Week* [On-

line]. Available: http://www.edweek.org/ew/vol-16/34cuban.h16

Cuban, L. (October 9, 1996). Techno-Reformers and Classroom Teachers. *Education Week* [On-line]. Available: http://www.edweek.org/ew/vol-16/06cuban.h16

Cuban, L. (1986). *Teachers and Machines: The Classroom Use of Technology Since 1920*. NY: Teachers College Press.

Educational Testing Service. (1997). Computers and Classrooms: The Status of Technology in U.S. Schools. Princeton, New Jersey: ETS, cited in *Education Week* (1997, May 21), Inequities in Access to Technology Documented [On-line]. Available: http://www.edweek.org/ew/vol-16/34tech.h16

Furger, R. (1998). *Does Jane Compute?: Preserving Our Daughters' Place in the Cyber Revolution*. NY: Warner Books.

Gates, B. (1995). *The Road Ahead*. NY: Viking.

George, Y. S., S. M. Malcolm, and L. Jeffers. (1993, May). Computer Equity for the Future. *Communications of the ACM*, 36(5), 78-80.

Hoffman, D. L. and T. Novak. (February 2, 1998). Bridging the Digital Divide: The Impact of Race on Computer Access and Internet Use, (Working Paper at http://www2000.ogsm.vanderbilt.edu/papers/race/science.html). Bridging the Racial Divide on the Internet, Science (1998, April 17).

Information Highway Advisory Council. (1997, September). Preparing Canada for a Digital World: Final Report. *Ottawa: Industry Canada* [On-line]. Available: http://strategis.ic.gc.ca/SSG/ ih01650e.html.

Information Highway Advisory Council, Learning and Training Working Group. (1995, December). Making It Happen: Final Report of the Learning and Training Working Group. Ottawa: Information Highway Advisory Council [On-line]. Available: http://csg.uwaterloo.ca/~industry/toc-e.htm.

Inkpen, K. M. (1997). Three Important Research Agendas for Educational Multimedia: Learning, Children, and Gender. In *Proceedings of Educational MultiMedia '97*, Calgary, AB [On-line]. Available: http://www.cs.sfu.ca/people/Faculty/inkpen/Papers/Ed-media_97/edmedia_97.html.

Karim H. K., S. Smeltzer, and Y. Loucheur. (1998, March). On-Line Access and Participation in Canadian Society. Paper presented to Knowledge-Based Economy and Society Pilot Project, Workshop 1, *Evidence Concerning the Emergence, Dynamics, and Requirements of the Knowledge-Based Economy and Society*. Hull, Quebec: International Comparative Research Group. Strategic Research and Analysis, Canadian Heritage.

Krugman, P. (1997). *Pop Internationalism*. Cambridge, MA: The MIT Press.

Logan, R. K. (1996). *The Fifth Language: Learning a Living in the Computer Age*. Toronto: Stoddard.

Moll, M. (1997). Canadian Classrooms on the Information Highway: Making the connections. In M. Moll, (ed.), *Tech High: Globalization and the Future of Canadian Education* (pp. 33-64). Ottawa: Fernwood/Canadian Centre for Policy Alternatives.

Montgomery, K. C. (1996, July-August). Children in the Digital Age. *The American Prospect*, 69-74.

Murray, B. (1996, December). Rise in school Internet use spurs creativity, problems. *American Psychological Association Monitor* <URL: http://www.apa.org/monitor/dec96/ mellon.html>

National Center for Education Statistics. (1996, February). *Survey on Advanced Telecommunications in U.S. Public Elementary and Secondary Schools*, 1995.

Neuman, D. (1991). Technology and Equity. *ERIC/IT Digest 1991*. ED339400 [On-line]. Available: http:// ericps.ed.uiuc.edu/npin/respar/texts/parschoo/techequ.html

Nordicity Group and Neilsen Marketing Research. (1996). *Ottawa: Neilsen/Nordicity Internet Survey* (Vol. 11).

Pollara. (1997). *A Syndicated Public Opinion Review of Canada's Cultural Sector*. Toronto: Pollara.

Postman, N. (1996). *The End of Education: Redefining the Value of School*. NY: Vintage Books.

Resnick, M. and N. Rusk. (1996, July-August). Access Is Not Enough: Computer Clubhouses in the Inner City. *The American Prospect*, 60-68 [On-line]. Available: http:// tap.epn.org/ prospect/27/ 27resn.html

Riel, M. (1996). The Internet and the Humanities: The Human Side of Networking. *The Future of Networking Technologies for Learning*. Washington, D.C.: U.S. Department of Education [On-line]. Available: http://www.ed.gov/Technology/Futures/riel.html

Robertson, H. (1998). No More Teachers, No More Books: The Commercialization of Canada's Schools. Toronto: McClelland & Stewart.

Sadker, M. and D. Sadker. (1995). *Failing at Fairness: How Our Schools Cheat Girls*. NY: Touchstone.

Sanders, J.; Koch, J.; & Urso, J. (1997). *Gender Equity Right From the Start: Instructional Activities for Teacher Educators in Mathematics, Science, and Technology*. Mahwah, NJ: Lawrence Erlbaum Associates.

Statistics Canada. (1997, May). *Household Facilities and Equipment Survey*.

Tapscott, D. (1998). *Growing Up Digital: The Rise of the Net Generation*. NY: McGraw Hill.

U.S. Congress, Office of Technology Assessment. (1995, April). *Teachers and Technology: Making the Connection* (OTA-EHR-616). Washington, D.C.: U.S. Government Printing Office [On-line]. Available: http://www.netc.org/cdrom/ota/html/ch4.htm

U.S. Department of Commerce, National Telecommunications and Information Administration. (1998, July). *Falling Through the Net II: New Data on the Digital Divide* [On-line]. Available: http://www.ntia.doc.gov/ntiahome/net2/falling.html

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