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M.J. Candidate

Education in the Information Age:
Why computers should be a cautious addition to teachers' tool kits

by
Bev Wake, B.J.

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfilment of
the requirements for the degree of
Master of Journalism

School of Journalism and Communication

Carleton University
Ottawa, Ontario
May 29, 2000
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Wired Classrooms:
Why computers should be a cautious addition to teachers' tool kits

submitted by Bev Wake, B.J.
in partial fulfilment of the requirements for
the degree of Master of Journalism

Thesis Supervisor

Director, School of Journalism and Communication

Carleton University
Date

ABSTRACT: Canadian classrooms are entering the information age with the introduction of computers and networked communications systems. Among governments funding the wiring of Canadian schools, one of the few growth areas in education today, there's a sense computers will help students learn and in turn make Canada a more competitive country. While students are using computers in interesting ways, the optimism may not be entirely warranted. Instead of rushing to connect classrooms, schools may want to slow down and look at where the expensive equipment can be used in the most effective ways. This thesis will look at how computers are being used in classrooms, why schools are computerizing and whether computers can help students learn. It will then look at the cost of computerization at a time of cutbacks and some of the hidden costs computers bring with them, including ties to the business world and online advertising.

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PREFACE

This thesis is designed to offer some insight into how computers are being used in Canadian classrooms today, for what reasons and at what cost. Due to the scope of the project -- and the size of Canada -- it was not possible to observe classrooms throughout the country.

Accordingly, observations will be limited to schools in Victoria and Lillooet in British Columbia and the Ottawa area of Ontario. Because observations were limited to B.C. and Ottawa schools, research at the government level is also focused on Ontario and British Columbia. It was hoped that in choosing those two provinces a range of experiences could be found. Not only are the two provinces separated geographically, they are separated politically. British Columbia is governed by the New Democratic Party and although school districts in that province have experienced cutbacks to education funding, they haven't experienced them to the same extent as boards in Ontario, governed by the conservative Mike Harris government.

Wherever possible, information has been provided about policies and programs in other parts of the country -- and in many cases the situations are similar throughout the country -- however there is an emphasis on programs in B.C. and Ontario.

INTRODUCTION

Roger Lauzon sits apart from the rest of the students in Joel Wrinch's senior drafting class at Lillooet Secondary School in British Columbia. The only Grade 12 student in the Grade 11-12 class, Lauzon is a year's worth of assignments ahead of the other students. In some ways, Wrinch says, Lauzon is also ahead of him when it comes to understanding the computer program used in the drafting class. Lauzon's intense brown eyes are softened somewhat by his dark hair and olive skin, but his interest in computers shines through in those eyes as he eagerly explains how easily computers can be incorporated into the drafting class, as well as the role they can play.

The drafting class is held in a lab with 24 computers, 10 of which are licensed to run a state-of-the-art drafting program called Micro Station. The cost of the licence was \$4,000 for two years, and Wrinch isn't sure the school will be able to afford to renew it when it expires in September 2001. Although Lauzon says he'd rather work in mechanics than in drafting after he graduates, he is convinced Micro Station helps drafting students learn and that the school should do what it can to make sure the licence is renewed.

The program, he says, isn't difficult to learn. And once it's learned, it not only saves time so students can move onto more complicated projects faster, but provides students with a range of onscreen views they may otherwise never see. Lauzon, for example, spent three weeks designing a hotel with the program -- line by line, block by block. Once designed, the computer program enabled him to look at the hotel from any angle. It allows full-architectural rendering of designs, using colour choices picked by the designer. The program, which also does three-dimensional mapping, even allows for landscaping outside the designed buildings.

"This is the best way to learn," Lauzon says. "I could probably spend my whole life on

here and not learn everything there is to learn.”

And, according to Lauzon, more teachers should use computers and software of this calibre in their classrooms.

“In today’s technological age, I think more money should be spent on computers, because computers are being used more and more -- more and more jobs are going to use computers.”

In many ways, Lauzon would be the perfect spokesperson for governments intent on seeing computers in every Canadian classroom, all hooked up to the Internet, and soon. Lauzon is so impressed with computers, he went out and bought his own just before Christmas 1999 -- a Pentium processor driven machine which, packaged with various programs he chose himself, cost \$2,099. Though he likes to play games sometimes, Lauzon says he uses the computer mainly for school work. There’s a lot of information available, he says, including copies of old provincial exams which can be used as study aids, and tutorials in subjects like math and physics.

But while Lauzon could be a poster boy for computers in the classroom, he also epitomizes some of the pitfalls -- like lazy research, a hesitancy to read and less learning.

Before he bought his own computer, Lauzon had used his mother’s for projects. His marks improved, he says, because his projects “looked more professional” than those his classmates did by hand. Lauzon used word processing programs for English assignments that would catch his mistakes with spell check and grammar check, mistakes that again would go unnoticed by many students unaided by computers.

Then there’s Lauzon’s favourite commands -- cut and paste. With many of his projects now, he says, he doesn’t have to read very much. He completed a project on B.C. last year by cutting and pasting from Encarta 98 and Web sites on the Internet. He says he did a “little bit” of rewriting and designed a title page.

"I don't think I actually read everything that was in there," Lauzon says, matter-of-factly, unaware that his tactics were at best unethical and at worst constituted plagiarism. He says he doesn't feel guilty. He got a good mark and contends he did the research himself -- downloading it from the CD-ROM encyclopedia and the Internet. Sure, students could also copy out of books and bound encyclopedias in the past, but at least then they had to read it and rewrite it rather than just transporting the material from one document to another with two simple commands.

Though Wrinch teaches with computers, he's well aware of such drawbacks. Students, he says, have a tendency to believe anything is true (which is dangerous when anyone can post anything on the Internet), and may no longer benefit from the research process.

"They just punch in some words in an Internet search engine and as far as learning anything, nothing went on."

Wrinch says computers take the problems inherent in learning technologies like calculators to a new level. He gives as another example a high school student unable to reduce a fraction of $24/64$. The student couldn't figure out that 24 was divisible by eight without a calculator.

"We rely on machines to do our job for us, and it's making kids dumber to be honest with you," Wrinch says. "Kids aren't as smart today as they used to be."

Learning is just one example of ways in which computers are changing education, and not always for the better. These changes are facilitated as much by computers in homes as those in classrooms -- classroom computers just extend the problem.

However, the Canadian government and its provincial counterparts seem convinced that computers will improve the education system. The federal government spent about

\$52 million between 1995 and 1998¹ on its SchoolNet program, which had linked all schools to the Internet by March 30, 1999. It budgeted a further \$25 million a year between 1998 and 2001. As part of the second phase of the program, every classroom in Canada's 16,500 schools should be wired by March 31, 2000. The SchoolNet program is part of a larger initiative called Connecting Canadians, which seeks to make Canada the most connected country in the world by 2001. The federal government pays just a portion of the tab, with provinces picking up the rest helped out by private contributions.

The information highway is being touted as a powerful tool to build more brain power for the knowledge-based society, while SchoolNet is designed to prepare all "learners" for that new society.

"The key to any nation isn't the brain drain, but the brain gain," explains Doug Hull, director general of Industry Canada's information highway applications branch. More brain power, he says, will help create a stronger and more innovative economy.²

Computers and the Internet are presented as powerful tools which will help the economy and enhance not only education but educational opportunity, no matter where students live or how much money their parents have to invest in technology in the home.

Individual provinces have promoted basically the same objectives as the federal government. In April 1998, for example, the B.C. government announced a \$123-million investment over six years to hook-up 1,700 public schools and 22 post-secondary institutions to the Internet through the Provincial Learning Network (PLNet).

However, while governments across the country are spending more money on technology -- on networks as well as hardware, software and support -- they're cutting educational services in other areas. As Simon Fraser University communications

¹Elise Boisjoly, SchoolNet, executive director, phone interview, 31 Aug. 2000.

²Doug Hull, interview, *The Wired Classroom*, Canadian Broadcasting Corporation, cbc.ca, April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

professor Donald Gutstein outlines in his book *e.con: How the Internet Undermines Democracy*, the Ontario government may have spent \$135 million connecting classrooms to the Internet, but it has also cut \$1.5 billion from education since 1995. In Alberta, Premier Ralph Klein announced a \$45 million investment in classroom technology in 1996, but the announcement followed cuts totalling \$224 million between 1993-96.¹

The Canadian Teachers' Federation (CTF) has decried lack of funding for education for the past decade, arguing in 1999 that "per pupil expenditures in Canada have increased by less than half a percentage point in four of the last five years and have declined in six of the last seven years in real terms."²

Carole James, vice-president of the Canadian School Board Association, says school boards throughout the country are struggling.

"Fifteen of 60 school districts in B.C. have budgets in deficit figures, Nova Scotia just made huge cuts in its education budget, and Ontario's a mess -- everyone's in trouble."³

School districts throughout the country are considering closing schools to save money and are making substantial cuts to programs like English as a second language, music, and special needs education. While in some parts of the country money is being spent on reducing class sizes and building new schools in growing suburbs, technology seems to be one of the few consistent growth areas in education-related government spending.

"I would think so," agrees Nick Scarfo, an education officer in the curriculum assessment and policy branch of the Ontario Ministry of Education.⁴

"There's an ongoing concern or need to maintain the technology out there," he says.

¹Gutstein 202.

²Canadian Teachers' Federation, "Critical Issues in Education and Technology," (<http://ctf-fce.ca/e/what/restech/critical/htm>) 28 Oct. 1999.

³Carole James, vice-president Canadian School Boards Association, phone interview, 7 May 2000.

⁴Nick Scarfo, Ontario Ministry of Education, education officer curriculum assessment and policy branch, phone interview, 19 May 2000.

"There's a firm commitment to maintain funding at a level that will ensure students have access to technology."

Computerizing classrooms is an expensive undertaking, yet few educators are opposed to the process. There is debate, however, when it comes to discussion about the role computers should play in modern schools -- and the debate is justifiable.

Investments in technology are being made at the same time governments are reducing social spending in many areas, education included. These cutbacks are effectively forcing schools to cut other programs, creating a situation where students can log onto the Internet but may not be able to take music classes or talk to a school counsellor.

"Other things are suffering: sports, extracurricular are suffering... the public has been sold a bill of goods saying your kids need technology," Lillooet's Paul Belland says. "It's not the big saviour that we thought it would be. Ninety per cent of people are still using it as a word processor. That's an expensive typewriter."

Computers, however, also seem to provide students and teachers with interesting educational opportunities and resources -- and it's easy to get caught up in the technology, as students show off exciting multimedia presentations and beautifully-crafted Web sites.

But will the investment be worth it in the long run?

"The jury is still out on technology," says Bernie Froese-Germaine, a researcher in the technology and research department of the Canadian Teachers' Federation, when asked if computers can help students learn.

And if the jury is still out, perhaps the best response would be to slow down, see where schools are at, and determine where computers are making a difference before deciding where to spend those hard-to-come-by education dollars.

There is extensive academic literature about computers and technology, but little of it explores Canadian classrooms as they actually are today in concrete terms, half way through the government's SchoolNet strategy. As is typical following the introduction and application of new technologies, much of the existing literature seems "extremist" in nature, proclaiming either the dystopian dangers of computerized classrooms or its opposite -- utopian promises.

Heather-jane Robertson of the Canadian Teachers' Federation, for example, is among the most vocal critics of computerized classrooms. In her 1998 book *No More Teachers, No More Schools* and a 1999 paper called "Shall We Dance?", Robertson argues that computers will mark the end of education as we know it, transforming education into a business that will eventually be run by inexpensive computers rather than salaried teachers. Her fear of computers replacing teachers is echoed by Simon Fraser University communications professor Donald Gutstein in his 1999 book *e.con: How the Internet Undermines Democracy*, and by U.S. technology critic and University of New York professor Neil Postman, author of more than 20 books including 1996's *The End of Education*. Postman also argues that computers, like television, are dumbing down society because they emphasize entertainment over content and substance.

American critic Clifford Stoll, author of *High Tech Heretic* (1999) and *Silicon Valley Snake Oil* (1995), argues that children learn computer skills so quickly that the skills needn't be taught in schools. Claiming society has fallen victim to the propaganda of the computer industry, he suggests instead that scarce education resources should be directed to teachers and other equipment. American educational psychologist Jane M. Healy, in her 1990 book *Endangered Minds* and 1996 book *Failure to Connect: How Computers Affect Our Children's Minds--For Better and Worse*, argues that children today are less able to absorb and analyze information and are less able to "think" than generations

before them. Computers, she says, may be partly to blame. Sven Birkerts, in his book *The Gutenberg Elegies* (1994), argues that computerized classrooms may signify not only the death of reading but the ability to construct arguments in a linear, organized fashion. John L. Ratey and Catherine Johnson, in their 1998 book *Shadow Syndromes: The Mild Forms of Major Mental Disorders that Sabotage Us*, argue that computer experts may even suffer from a mild form of autism that leads to social ineptness. Computers in the classroom may exacerbate these problems, they suggest.

On the other hand, other scholars and researchers are convinced that computers will improve the quality of education. In his 1992 book *The Children's Machine*, Massachusetts Institute of Technology professor Seymour Papert argues that schools are failing children by not modernizing. Children who grow up watching television, playing video games, and surfing the Internet, he says, will have discovered that learning can be "fast-paced, immensely compelling and rewarding." Schools as they exist today, he argues, are slow, boring and out of touch. Further, he argues that unless schools computerize, only children of wealthy parents will benefit from computers -- and he says that is undemocratic.

In 1998's *Growing Up Digital* -- which is based on research that involved several hundred children and adults on six continents -- American critic Don Tapscott argues that children without access to the new media will be "developmentally disadvantaged." Computers, he says, help children better develop motor skills, language skills and social skills, as well as cognition, intelligence, reasoning, personality, a sense of self and values.

"All of these are enhanced in an interactive world," he writes. "When children control their media, rather than passively observe, they develop faster."

¹Seymour Papert, *The Children's Machine: Rethinking School in the Age of the Computer* (New York: Basic Books, 1992) 5.

²Don Tapscott, *Growing Up Digital: The Rise of the Net Generation* (New York: McGraw-Hill, 1998) 7.

In *being digital*, published in 1996, Massachusetts Institute of Technology professor Nicholas Negroponte argues that computing is no longer about computers, but about living -- and if schools don't adapt, they will become museums. Computers, he argues, will allow children to learn through exploration -- through reinventing the wheel and figuring things out for themselves.

Perhaps not surprisingly, Bill Gates devotes an entire chapter of his 1995 book *The Road Ahead* to the benefits of computers in education. In addition to helping students, Gates argues computers will also benefit teachers. The Information Highway will "bring together the best work of countless teachers and authors for everyone to share."

Much research has been published about the effects -- negative, positive and indifferent -- that computers have on students' academic achievements. Many of these results have been published in *ERIC Digests*, produced by the United States Department of Education, and other educational journals. While some of the research on computers in education suggests computers can aid the learning process, other research shows these studies are faulty because they concentrate on one aspect of education -- technology -- while ignoring the other factors that enhance learning, including teachers.

Other research illustrates how other traditional programs can help students learn as much as machines. Music programs are but one example. While school districts are welcoming computers into classrooms, music classes are among the "non-essential" programs that have been cut at Canadian schools.

While research to date has been both interesting and highly informative, little of it has involved the observation of Canadian classrooms or incorporated the views of teachers and students themselves -- those who are actually using the technology today.

In *The Road Ahead*, for example, Bill Gates's projections about the benefits of

"Bill Gates, The Road Ahead (New York: Penguin Books, 1995) 185.

computers in schools are based on his vision of a laptop for every student. Neither U.S. nor Canadian schools have come close to approaching that reality. According to Statistics Canada figures, released in 1999, the pupil-computer ratio was 9:1 at the elementary level, 8:1 at the intermediate level and 7:1 at the secondary level, although the figures vary from province to province with a high of 15:1 at the elementary level in Nova Scotia and a low of 5:1 at the secondary level in Manitoba.

The topic of computers in schools is obviously a broad one. In order to provide a thorough and comprehensive analysis there are several worthy sub-topics that will not be included in this particular discussion. The paper will focus solely on Canadian public schools, avoiding analysis of private and post-secondary schools, however interesting and similar the implications might be. Similarly, the paper will also leave aside the issue of how computers may benefit students in special needs programs -- including those for at-risk students or hearing or visually-impaired students. While such subjects are interesting, this paper is based on a look at how computerized classrooms will affect the majority of Canadian students.

Except for a brief mention in the concluding chapter, the paper will also avoid analysis of "end of education" theories which make dire predictions about computerized classrooms presaging the death of teachers and schools as they exist today. This argument has already been made by authors like Heather-jane Robertson. Little attention will be paid to this doomsday argument for three reasons: one, it has been done; two, while current policies may open doors to that possibility, current investments are nowhere near eliminating the need for teachers or schools; and, three, teachers will always be needed to facilitate if not teach classes.

The concept of virtual schooling, though a very interesting topic (particularly given

the increasing number of families choosing to educate their children at home), will also be avoided. It does not directly pertain to the discussion of computerized classrooms, given that this analysis will focus on the average Canadian student, and would be too large a branch to explore. While federal and provincial governments seem intent on encouraging the marketing of education and curriculum on a national and international basis, such a discussion is best left to another study. For the same reason, discussions about education becoming a private business -- in which schools would lure the best and brightest through the quantity and quality of their technical equipment -- will also largely be avoided.

This book will attempt to build on what has been written and fill a gap in existing literature, by analyzing how schools are adapting right now to computerization. It will then look at the implications of the digital path that schools appear to be taking, while recognizing that school and government policies and strategies can change.

Information has been gathered from a variety of sources including: interviews with students, teachers, administrators, bureaucrats and experts on the topic of computers in the classroom; observations of schools in B.C. and Ontario to supplement published studies and articles on computers in Canadian classrooms; and, academic evidence from various scholars in North America who have already written intelligently on the topic.

In order to understand the debates over computerized classrooms, it's necessary to understand how computers are being used -- by students, teachers and administrators. To that end, *Chapter One* will provide a glimpse of Canada's computerized classrooms as they exist today, based on observations from schools in B.C. and Ontario. The chapter will also look at Internet resources and Web sites, to provide the reader with a picture of the modern learning environment.

Chapter Two is designed to add context to the first and subsequent chapters by looking at the various factors that influence how education is delivered in Canada. It will very briefly trace the history of education in Canada in a broad sense, offering some insights into the objectives of education over time which may not be as obvious as they may seem at first. While almost everyone would agree that the purpose of schools is to educate students in the best way possible, the means to the end differ and this chapter will address some of the differing views at play.

This section of the chapter will pull from literature on the history of education in Canada, as well as theories on how students learn. In doing so, it will also look at Canada's unique features, including the fact that education falls under provincial jurisdiction but relies at least in part on federal funding. Though education lies outside federal jurisdiction, the national government is able to influence the way it is delivered by funding the system's architecture -- through programs like SchoolNet -- and through the amount of money provinces receive in federal transfer payments. The chapter will also look at societal factors which influence the delivery of education, including the transformation to the high-tech information age.

Chapter Three reviews the key literature on the subject, analyzing the debates about the pros and cons of computerized classrooms. It explores existing literature in the field, as well as studies found in scholarly journals and sources such as the *ERIC Digest*, and complements it with observations from today's Canadian classrooms. Not all studies cited are Canadian, but developing countries worldwide are facing similar issues as they attempt to integrate technology into classrooms. Pedagogically, it is the pivotal chapter because the analysis shows that despite the move to computerize classrooms, no one is really sure about the impact, positive or negative, of computer-assisted learning.

Moving from pedagogy to economics, *Chapter Four* looks at the costs and benefits of

computerized classrooms, in economic and social terms. It begins with a discussion of the money that has been spent on technology, from infrastructure to hardware. It will look at both the short-term costs and the long-term follow-up costs. While governments across Canada have invested millions of dollars in technology, education funding has been cut in myriad other areas. One can rarely watch a newscast or pick up a newspaper, without hearing about student protests, school closures or battles to save special education programs. Could money currently being invested in technology be better spent in other areas, such as keeping small schools open, early literacy programs, special education, music programs, extra-curricular or library budgets? This chapter will look at what these programs offer students, and what they may be losing as they're cut back or cut out entirely.

Chapter Five will focus on the relationship between private companies and public schools -- a relationship that seems to be more acceptable when computers are part of the package. Cuts to education and the push to computerize classrooms have caused some schools to look for alternative sources of funding. Heather-jane Robertson, in her 1999 paper "*Shall We Dance?*", argues that businesses are luring schools into a dance partnership in which schools will have little choice but to follow their lead.

Athena Educational Partners Inc. is one example of proposed ties between education and business. The Canadian company, based in Montreal, produces the controversial Youth News Network. The organization promises schools up to \$200,000 worth of technological equipment -- including a fully-networked computer lab with high-speed Internet access, as well as televisions and VCRs for every classroom. In exchange, schools must agree to show students a daily Youth News Network newscast, which runs about 14.5 minutes and includes about 2.5 minutes of advertising. YNN received no commitments from Canadian schools until it added computers to its offer.

Using YNN as a case study, *Chapter Five* will analyze the implications of schools accepting advertising in exchange for computers, as well as the pedagogical implications of such agreements and how they may conflict with the objectives of education.

Chapter Six will draw conclusions by pulling together the information presented in the previous chapters. In so doing, it will also necessarily look to the future. Despite objections, there is no indication that governments will suddenly pull the plug on plans to wire Canada's schools. The chapter will pull in predictions, both dystopian and utopian, about the future of computerized classrooms. It's important to note that policies are never static. Just because the infrastructure is in place, it doesn't mean governments can't go back and say "we neglected special education, now let's fix it." To do so, however, it's important that governments proceed with caution when restructuring classrooms with computers, and that they also monitor the effects of computerization.

Computers will play an important role in society and should also assume a role in the education system. However, leaping in with large investments while neglecting other areas may not be the best solution. Computers are relatively new and still evolving and, just as it took some time to determine that television was not the educational tool it was originally made out to be, it will likely take time and studies to determine the true effectiveness of computers as a learning tool.

Debates about computerized classrooms are being conducted in countries throughout the developed world, from the United States, to Europe, to South Africa to Australia. But it's important to remember that computers and the Information Age are a reality for only a small percentage of the world's population.

As Don Tapscott writes in *Growing up Digital*, technology has created a growing gap between have and have-not nations.

"Globally, most children are not growing up digital," Tapscott writes. "In fact many of them will not grow up at all. One billion people were born over the last decade -- the biggest increase in human history. However, 97 per cent of them were born in developing countries that often lack the ability to feed, house and educate them. More than half of the 1.2 billion children aged 6-11 in the world have never made a phone call."¹⁰

The topic of this book, however, is still timely and relevant. Computers are playing an increasingly important role in society and, perhaps necessarily, in schools as well. At the same time, schools throughout the country are going through enormous upheavals wrought by cutbacks to education funding. Schools are closing, special needs and music programs are being cancelled, and school districts are amalgamating. But technology is still being funded and it is only through an analysis of the costs and benefits of this funding in all their ramifications -- looking beyond dollars alone -- that Canadians will be able to decide to what extent the policies are worthwhile.

¹⁰Tapscott 12.

CHAPTER ONE

Smart classrooms, smart kids?

Krystal Piamonte and Ziad Akkaoui, both 15, glance at one another, hesitantly, before answering the question.

"Is it more fun to sit in a class with a teacher or learn through a computer program?"

Finally, Piamonte, a student at Brookfield High School in Ottawa, breaks the silence.

"It depends on the teacher a lot," she says. "Mr. Kubanek's class sitting out there is more fun than working on the computers, but for other teachers it would be a lot better to be working on the computers."

Adds Akkaoui: "last week he made pancakes."

Gordon Kubanek teaches science at Brookfield High School, and would be the first to admit his lessons are less than conventional. But while he occasionally makes use of his culinary skills to demonstrate the finer points of chemistry, he is more likely to use computers.

In fact, eight of Kubanek's chemistry 11 students -- including Piamonte and Akkaoui - - were moved from his classroom in April. Instead of sitting at desks and taking notes from a lecture, the students studied two chemistry 11 units on a computer and the Internet.

The pilot project, Kubanek says, was designed to see if instruction delivered through computers would be a valuable learning tool. By the end of the experiment, Kubanek expected to answer three questions. First, can students learn this way? Second, what could be made better? And, finally, would students recommend this approach to learning as something that could or should be accessible to all students in the future?

Preliminary results suggest that yes, students can learn through computer programs and, yes, in some instances they would recommend other teachers adopt a similar

approach to teaching.

Kubaneck is also interested in studying how computer-based instruction changes the relationship between the teacher and the student. To use education lingo, Kubaneck says the teacher changes from being a "sage on the stage" to a "guide on the side."

Lessons delivered entirely via computer are still rare in Canadian classrooms. Perhaps that's because, as Kubaneck says, students participating in his pilot project found they needed more of his time than the three or four minutes a day he spent with them when the project began. Other factors may also be at play -- such as the small number of computers available to individual teachers and slow Internet access.

Still, Kubaneck's experiment is an interesting example of how teachers can incorporate computers into their lesson plans. It's one of many approaches being taken by teachers throughout Canada -- including other classrooms in Ontario and British Columbia which will be the focus of this book.

IN OTTAWA...

Brookfield High School

In a small room normally used by the lab technician at Brookfield High School, Piamonte and Akkaoui attempt to show how chemistry lessons are delivered on the computer. They are working on a PC with a 17-inch monitor, sitting on a trolley which makes it easier to move to other classrooms when necessary

Kubaneck is teaching in the next classroom, and his energetic voice can be heard through the door as he prepares another class of chemistry students for a test. He eventually pokes his head into the adjoining room. The timing is good since Akkaoui has had trouble logging onto the computer. Sometimes, Kubaneck explains, that happens in the afternoon when more people throughout the school district are online, causing the

system to congest.

It turns out the computer just didn't want to recognize Akkaoui's name, and the problem is resolved when Kubanek types his own identification into the system. The program flashes up on the screen almost immediately.

The chemistry course was designed by the EDEN (Electronic Distributed Education Network) Project, a non-profit organization based in Orillia, Ont. It's a consortium of six school boards in southern Ontario, including Simcoe County, York Region, Upper Canada, Toronto, Hamilton/Wentworth and Dufferin-Peel Catholic. It's the first service of its kind in Canada to deliver full secondary school credits online.

Kubanek learned about the group through a listserv he belongs to -- Teachers for Excellence. He decided he wanted to offer the program in Ottawa, and approached EDEN, the Brookfield administration and the Ottawa Centre for Research Innovation (which, funded by Industry Canada, brings together government, business and education representatives to encourage Web-based learning) with proposals. As part of the agreement, Kubanek is expected to post the results of the experiment on the Internet.

He had no trouble getting volunteers for the pilot project, despite the fact he required students to sign contracts and their parents to sign permission slips. The contracts stipulated that students had to have an A or B average to apply. In addition, students had to be computer literate and possess the following skills:

- have experience with the Internet, e-mail attachments, etc...;
- understand different file types, how to download files and create folders for their work; and,
- be highly motivated, self-directed and disciplined learners.

Although all coursework was expected to be completed at school, students were advised it would be helpful if they had a computer at home from which they could

communicate with Kubanek via e-mail. Kubanek planned on taking five students from his three chemistry 11 classes, but ended up with three times as many volunteers, and had to turn half of them away.

"I was completely overwhelmed," he says.

Both Piamonte and Akkaoui were able to give detailed explanations about the program, despite the fact that, at the time, they'd only used it for three weeks.¹

The chemistry course is broken down into a number of different units and sub-units. Click on the unit called "Solutions," and you're transported to a screen with a list of a half-dozen sub-units. Click on one of the sub-units, and you're greeted with a lesson that includes assignments and tests. On the upper-right hand corner of the screen, there's a list of Web sites students can visit to help answer questions for their various assignments.

The course can be completed not only without paper, but without any other aids. At a click of the mouse, students can access a calculator or periodic table, as well as a notepad on which they can type up notes to access any time they wish. If students are taking a test through the program, the computer automatically creates a log file, called prob.log, which they can send to their instructor as an e-mail attachment.

Though some might think students would tend to rush through lessons without learning the material if left unsupervised, Kubanek says that hasn't been the case.

"Depending on the person you can start to slack off actually, so you do need some external prodding at appropriate moments, but that depends upon the person," he says.²

Three weeks into the experiment, and Kubanek had already had to modify the way the course was delivered. Originally, students were to work by themselves -- which they didn't like.

¹Krystal Piamonte and Ziad Akkaoui, Brookfield Secondary School students, personal interviews, 20 April 2000.

²Gordon Kubanek, Brookfield Secondary School teacher, personal interview, 20 April 2000.

"We had some people just working on the computer alone -- it worked for about two days and died. But when they were in groups of two or three, it worked much better." Kubanek says.

"It would be much harder doing it alone, because with two people you can interact with each other and figure out the answers to everything," says Piamonte. "But for someone doing it alone, you might lose interest very fast."

"In the classroom you have this feeling that everybody's around, you're not the only person there," Akkaoui says. "But if you're working by yourself it gets boring."

Kubanek also needed to increase the amount of time he spent helping students, by bringing in a substitute teacher to work with his other chemistry students in the traditional classroom. He'd previously spent three to four minutes a day with the online students, but says they definitely needed a teacher there more often. And it's not just his opinion -- two weeks into the course, he had students complete an evaluation form on which they indicated, among other things, that they needed more teacher support.

Lack of teacher support is one of the reasons Piamonte says she's not sure if the program could be used successfully outside of school.

"I'm iffy about if it was in your home or something and you were doing it as a correspondence course," she says. "It would be a lot more difficult unless you had an ongoing teacher or someone there to consult and help you out with it."

If the teacher isn't delivering information directly, Kubanek says, he or she needs to be available as consultant when students need help. This reverses the traditional relationship between teachers and students, in which teachers provide students with information throughout the class -- at whatever pace they choose.

"Rather than the teacher deciding this is what I think you need, the student decides I need you now," he says.

The approach is similar to the “Just in Time Learning” philosophy adopted by businesses like Dell Computers. The philosophy holds that people learn information when they need it -- they do it, they’re in charge, and the hope is the retention will be greater. Kubanek says.

Especially in a chemistry course, however, computers can’t deliver all the information students need. Experiments, for example, can only be done effectively “live.”

In addition, survey results suggest that students like to have a regular class once in a while to reconnect and interact with other students. If these regular classes revolve around demo labs, Kubanek says, it doesn’t matter if some students are ahead of others or behind in the material.

Perhaps one of the biggest advantages of programs like EDEN’s, is that they allow small, rural schools to offer courses to students that may not have been offered in the past. If there are only five students in the school interested in taking a certain course, for example, the school may not have been able to afford to allocate a teacher to that course. Now, with online lessons, five students from one school can join five from another, and another, and another. The course can then be offered long-distance, with an instructor available online.

But the main thing about the program, says Kubanek, is that it puts the emphasis on individual students, allowing them to work at their own pace.

“This is what’s good about the program,” says Akkaoui. “You can go at your own pace. You can take two days or one hour. It depends on the person, whoever’s doing it.”

This eliminates some of the problems inherent in traditional classrooms, Kubanek explains, when the teacher dictates the pace at which students learn.

“(Normally) some kids are getting it and other kids aren’t, so if you get it you’re bored,” he says. “Well, here you just keep moving. And if you’re slow you don’t feel

dumb because you're not slower compared to anybody. You're doing whatever you need to do, so you can individualize that way."

That approach, students say, has both advantages and disadvantages.

"You have to really be self-motivated," Piamonte says. "You have to do it all yourself, because there's nobody there telling you to do it."

"For me, basically, it's a bit better because you don't have someone on top of you saying do this, do that," Akkaoui says. "It's like do whatever you want. But I don't think that works for everybody."

Preliminary results from the pilot project, however, suggest that marks will increase or stay the same when students use computer-assisted instruction.

"Mine are higher," says Akkaoui. "I think because it's less stressful."

While Piamonte says her marks have stayed about the same, she agrees it's less stressful to have lessons delivered over the computer. And because she's working in a smaller group, there is less distraction and this helps her learn.

But no type of instruction, Kubanek says, will work well for everyone. Some students, for example, learn better with visual aids. Computerized lessons such as those offered by organizations like EDEN attempt to address this learning style, by adding visual components to their courses.

Take the following excerpt from a poem as an example of EDEN's lessons.

*Beware the Jabberwock, my son!
The jaws that bite, the claws that catch!
Beware the Jubjub bird, and shun
The frumious Bandersnatch!...*

*And, as in uffish thought he stood,
The Jabberwock, with eyes of flame,
Came whiffing through the tulgey wood,
And burbled as it came!*

Students may have difficulty deciphering exactly what Lewis Carroll meant when he

described the Jabberwock in *Through the Looking Glass*. Some editions of the book have an illustration of the Jabberwock, which would give students a more complete idea of what the creature might look like, aside from its jaw, its claws and its flaming eyes.

Computerized lessons like those developed by the EDEN Project go one step further. When students study the poem in computerized English classes, a Jabberwock flies across the screen as it makes a loud noise, somewhere between a hiss and a moan. The description of the creature, written in what resembles Old English, suddenly takes on new meaning. EDEN uses similar strategies in other components of its courses. A section called EDEN Theatre, for example, features video clips from *Lord of the Flies* and *Hamlet*, as well as Great Moments in Chemistry and a section called *On the Future*.

According to Kubanek, the different teaching tools are helpful -- in some circumstances.

"It's not meant to be a fix it or the solution," he says. "Think of it as one of several solutions, or options or tools. You know, I have a hammer, a screwdriver, I have pliers. Think of it like that. It's a very valuable and powerful tool, but don't say this will save and change education. I think that's a bit thick. I wouldn't do that. But I think if you don't do stuff like this, it's toast. I don't actually see it as an option. I see it as necessary, in some form."

However, according to Piamonte and Akkaoui, this is the first time they've used computers to this extent in any class at Brookfield High School. In fact, they say computers are rarely used in most classrooms, and most of what they know about computers they've learned on their own.

Long before Kubanek brought EDEN project lessons into his chemistry classroom, however, he'd already incorporated computer activities into his lessons. The Internet, he

says, offers teachers a range of resources that they can take advantage of -- often for free.

Kubaneck uses a program called "Threshold 21" in an Ontario Academic Credit (OAC) class, something he downloaded free off the Net. OAC classes are offered to students who have already completed Grade 12 courses.

The Threshold 21 program allows students to "govern" a developing country. It was developed by the Millennium Institute, a development research and service firm headquartered in Arlington, Virginia. MI has worked with more than 50 countries on sustainable development initiatives, including Bangladesh, Benin, Cambodia, China, Italy, Latvia, Malawi, Somalia, Tunisia and the United States.

When students use Threshold 21, they must decide how to allocate money into four areas: social, finance, industry and environment. In each sector, there are various sub-categories in which money can be allocated. Under social spending, for example, students decide what percentage of funding they will invest in education, health, population, nutrition or HIV/AIDS initiatives.

"Rather than me telling you this is the best way to run your country, you decide," explains Kubaneck.

The program has what Kubaneck calls a "momentum scenario," which enables students to see how their spending decisions would affect the country. If money is directed toward improving literacy, for example, momentum scenarios show how the investments would affect literacy rates for the next 20 years compared with current investments. Or, one can see if investing in literacy would improve other aspects of life for the people in the country.

"It doesn't give you static information, but gives you the ability to see things," Kubaneck says. "You can only do that with computers. It's not about the right or wrong paradigm, but involving yourself, explaining what you did and why and how you got the

results you did.”

Kubaneck also uses other computer programs which use a simulation approach called “system dynamics,” which was developed in 1960 at the Massachusetts Institute of Technology business school. One program, called Stella, is run through a CD sent to him at no cost. The program helps students learn about the environment through computer simulations. In one case, for example, students are presented with a situation in which a company wants to build a refinery near the school. There is concern the refinery would destroy a pond on school property. Students are expected to determine -- through various high-order math equations programmed into the computer which students wouldn’t have the skills to do themselves -- how much water is in the pond and how the refinery might affect nitrogen pollution levels. Students can plug in different scenarios -- including emission levels from the proposed refinery -- to see how the pollution level would be affected.

“They have this scenario, and rather than me being the sage on the stage they do their own thing,” Kubaneck says.

In other classes, Kubaneck gives students a list of assignments they can choose from. Invariably, there are computer options on the list. About half of the students usually choose those options. According to final reports -- in which Kubaneck expects students to explain not only what they learned but the learning process as well -- the computer options aren’t the easiest ones. Comments from students include: it was hard, it forced me to work on my own, you dropped me into something and made me figure it out by myself.

The comments please Kubaneck, who says his approach resembles what people in the business world refer to as “Serious Play.”

“Students learn by exploring,” he says. “Give them tools to find their own answers.

Consultants do it because they're smart -- if they do it, why can't I?"

Students may find the work challenging, he says, but in the end they will have completed assignments that would frighten many adults.

"To someone who's older, it looks completely overwhelming," he says. "But to kids, it doesn't, especially if they see that I'm confident. They may not be confident, but if they see I'm confident they can do it, they become confident."

Mutchmor Elementary School

It's difficult to make out the smell on the first floor, but by the time you're halfway up the stairs to the second floor of Mutchmor Public School the smell becomes recognizable -- paint.

Students in the school's gifted program kneel on the floor, using big paint brushes to cover mural paper with a dark blue-green paint. At the other end of the hallway, students are painting a similar piece of paper sky blue. In two adjacent classrooms, other students are drawing fish, seaweed and marine life, some of the images copied out of old encyclopedias. The artwork is part of a project teachers have called "Under the Sea." The paper covered in dark paint will become the ocean; the light blue the sky. Paper fish will eventually swim in the ocean, which will be hung in the hallway.

The children are doing what they've been asked, but their voices echo through the hallway. There's the odd argument, a lot of laughter and a lot of smiles.

There is at least one computer in every classroom at Mutchmor, located in the Glebe which is one of the wealthier areas in Ottawa. But not one computer is turned on.

Six-year-old Laura, a Grade 1 student doing language arts in a regular classroom, says students in her class only use the computer once they're done all their other work.

"If you're the first person done you get to go on the computer," she says. "If you're

the second, you get to go on the other computer. We play games.”³

Midway through the class, however, most students are hard at work in their notebooks. They’ve just learned how to spell the word bridge, and are drawing bridges in the empty space above the lined writing paper in their books. Other students have been divided into two groups. The teacher reads a story to one group, while a volunteer assistant reads to another group.

“I like playing on the computer,” Laura says. However, her favourite class is gym and she likes painting more than computer games. She proudly stops colouring her bridge and points at a painting above the blackboard with her name on it. It’s a picture of her with her older brother, sister and parents.

Principal Barbara Campbell says computers can never completely replace other traditional tools -- like paint and paintbrushes. Young students, she says, still need tactile experiences.

“Within the classroom there’s still very much a need for pencil and paper,” she says. “The computer really is one tool of many to be used in terms of learning. And it would make our lives much poorer if we had only one tool.”⁴

Still, Campbell says she’d like to have more computers in her school. Mutchmor received \$13,000 in funding for 1999-2000 to upgrade their computers.

“I would have been very, very happy with three times the amount of money,” Campbell says, adding many of the computers are still outdated.

The school was able to upgrade the lab so it would have 13 computers -- a ratio of about one computer per two students for most teachers who choose to use the lab.

The school couldn’t afford any more improvements, Campbell says, because the technology is expensive.

³Laura, Mutchmor Public School student, personal interview, 8 May 2000.

⁴Barbara Campbell, Mutchmor Public School principal, personal interview, 8 May 2000.

She would have liked to spend more money on primary reading programs -- like "Wiggle Works." Wiggle Works, she explains, combines computer programs with books, a teacher resource manual and guides. Students are able to listen to the story, read along with it, and use the program to help them complete exercises.

"It's not as good as having another adult in the room, but it certainly is a help," Campbell says. "Children can become much more independent in terms of finding help."

To use the program effectively, however, Campbell says the school would need five Pentium-driven computers per classroom to set up mini-labs -- a total of 15 computers if the program was to be used in senior Kindergarten, Grade 1 and Grade 2 classes. Most classrooms have two computers.

"Our budgets really can't handle that kind of money," Campbell says.

Campbell hopes to raise enough money through fund-raising campaigns to buy the necessary computers and software, but admits she's lucky she works at Mutchmor. Located in an affluent area, fund-raising campaigns work at that school. Other schools, she says, don't have that advantage.

Teachers will likely approve of the campaign, Campbell says, because most would prefer to have computers in their classroom.

Randy Little, who teaches a split Grade 1-2 class, agrees.

"Rather than the lab, I would rather see a couple more computers in classrooms to use in a controlled environment, and then have some extra help for the kids," he says.⁴

Still, Little is one of about 25 per cent of teachers at Mutchmor to take his students to the computer lab.

The students say they love it, and their enthusiasm is obvious -- even if they don't do what they're supposed to do. Asked to type their journal entries into a word processing

⁴Randy Little, Mutchmor Public School teacher, personal interview, 8 May 2000.

program, just three pairs of students actually do so -- with painstakingly slow one-finger typing. Three of the remaining six pairs of students play with a program called Kid Pix instead, which allows them to draw pictures. Among the other three pairs, two of them are playing a game called Reader Rabbit, which is designed to reinforce basic writing and math skills. Two other students are playing a game that teaches them about compound words.

It's not readily clear how much learning is going on.

"I already know compound words," says one student.

"She plays it 'cause it's easy," says the student beside her.

However, Dorilyn Kooy-Roome says computer games can be educational. She teaches a primary assessment class at Mutchmor, which helps children with language and developmental disabilities, and has three computers in her classroom. She says most of her students do seem to benefit from using them.

"They love it. They really do," she says."

One student needs the computer to write because he can't use pencils and paper. He types up his assignments, prints them out in the library (where the only printer connected to classroom computers is located) and then cuts out the entries and pastes them into his journal.

"For him, that's how he'll do his writing as an adult," says Kooy-Roome, adding she has put in a request for funding which would buy the student a personal computer.

For now, however, she largely makes do with what she has. That includes CD-Roms she's brought from home -- like Reader Rabbit -- which she uses with her own children, because there's no money to buy more copies of the program for the school.

"Dorilyn Kooy-Roome, Mutchmor Public School teacher, personal interview, 8 May 2000.

BACK IN BRITISH COLUMBIA

Lillooet Secondary School

You'd think they were two students instead of teachers sitting in front of the computer, giggling at the phrases they had superimposed on pictures of students and teachers at Lillooet Secondary School in British Columbia.

The images flash by in a computer slideshow accompanied by music. Suddenly, it's Ricky Martin singing "La Vida Loca," and the giggles turn to outright laughter -- attracting the attention of the few students still working in the computer lab over their lunch break. Now, Ricky Martin's picture is also on the screen -- although through the magic of computers his face has been replaced by the faces of various teachers, one at a time. The names of the teachers are superimposed underneath, although all their first names have been changed to Ricky.

The slideshow is part of a Christmas celebration, which includes skits and a sing-a-long followed by turkey dinner for all students and staff, scheduled for the last day of school before Christmas break 1999.

"The kids will love it," says physical education and science teacher Troy White when he finally stops laughing.⁷ In his late 20s, White is a large man, about six feet three inches tall and well over 200 lbs. But he's not particularly intimidating. Dressed in athletic gear, with a whistle hanging from a string around his neck, he's relaxed, approachable and quick to make a joke. He's well liked by students and, combined with the athleticism that earned him spots on provincial volleyball and basketball teams during his high school days on Vancouver Island, it's obvious why students don't complain when they have to play hoops on the same team as their teacher during phys ed classes.

Paul Belland is a former physical education teacher himself, but he lacks White's size

⁷Troy White, Lillooet Secondary School teacher, personal interview, 13 Dec. 1999.

and gregarious nature. He's approachable and also has a good sense of humour, but it's more subtle. He's about 10 years older than White, his voice is softer, he wears glasses and, dressed in clothes far more formal than a phys ed teacher's, he looks the part of the computer teacher he's become.

As the computer slideshow comes to an end, it's not difficult to figure out who the credits refer to: the "jock and the geek."

Lillooet secondary school is located in central B.C., a couple of hours northeast of Whistler on the Gold Rush Trail. The school has 24 computer stations in one lab, 24 in another lab next door and one classroom with eight computers for word processing. There are four computers in the library, which also has an electronic card catalogue. In addition, every classroom and office has one Internet connection, while some have two. In total, there are about 70 computers at the school which Belland says "is not enough." Because School District 74 is so spread out geographically -- with almost two hours of driving separating some schools -- a district-wide learning resource centre has also been set up through a Web server, so anyone at one school can see what resources are available throughout the district and then have them shipped over.

The "jock" isn't computer illiterate. But with just one computer in his classroom, he says he can't incorporate it effectively into science lessons. Sometimes, while students are working, he'll go onto the Internet or e-mail his wife Jeanette, another teacher at Lillooet secondary school who was on maternity leave having just given birth to the couple's second son. He also uses the computer to record his students' marks, as do all the teachers at the school. The program they use does make his job easier in some respects. Although all marks still need to be recorded in books as well in case the

computers crash, the program adds up all marks and determines overall averages -- as well as lesson averages which can better help teachers determine which lessons students may not understand properly.

The "geek," on the other hand, has completely incorporated computers into his classrooms. He benefits from the fact that he teaches Information Technology 11 and 12 - in a computer lab that with 24 computers has a 1:1 student-to-computer ratio.

"As much as possible it's paperless," Belland says of the course.*

There is no homework in his class because students may not have access to computers and the Net at home, so they are expected to work on their assignments the whole time they are in class. All notes and assignments are posted on an internal server. Only the odd time will students be asked to print something out. Belland also uses a computer, connected to a large screen at the front of the classroom, to facilitate peer evaluations. Students in the class complete their projects which are then shown on the screen and marked. Usually, Belland says, he averages out the marks: out of a mark of five, self-evaluation counts for 60 per cent, and peer evaluation for 40 per cent. The marks, of course, are sent via e-mail.

"It's a whole shift in your thinking -- it's basically correspondence on the machine," he says.

The course has been run the same way for almost seven years.

Paul Belland's classroom is quiet -- surprisingly so.

Grade 12 student Patrick McCrossan says it's quiet because everyone has to get their work done during class time -- and it's only once they finish that they can move on to do other things. So far, McCrossan says, he's learned how to use the Internet and how to use Hyper Studio -- a program that allows users to bring together text, sound, graphics and

*Paul Belland, Lillooet Secondary School teacher, personal interview, 13 Dec. 1999.

videos to create multimedia presentations."

McCrossan says the course gives him skills that he can then use in other classes like English and biology. It's also given him what he considers to be work experience -- students designed Web pages for the elementary school and local recreation centre.

The students' projects are fun to look at. Using a "Freehand" program, they have learned to use the computer to draw. Their assignments are posted on the wall, side by side with originals they've duplicated through the computer program. Using Hyper Studio, other students have produced books and quizzes. Some of them are quite professional looking, combining visuals with narrative.

Other students built their own Web sites.

Amanda's Ultimate Dragon Home Page

(www.webstar.sd74.bc.ca/~amanda/amandaB.html) is one example. The site is billed as a source of information for the greatest creatures to ever walk the face of Krynn. There are some spelling and grammar errors, but the student obviously had to assemble a lot of information to build the site. In addition to basic information about dragons, in which the student included some of her own opinions, the site also includes a bibliography, pictures and links to other sites. To package the information, the student had to develop design and layout skills, both of which call for creativity. The site is readable and aesthetically pleasing.

On Barbara's Budgie Page (www.webstar.sd74.bc.ca/~koot/barb.html), a Grade 9 student assembled information for people who own or want to own budgies. The Web site includes a video of a budgie hatching (Belland says she figured out the code to include the video clip herself) as well as other pictures. In addition, it includes information on budgie care, diet, size, rare and specialty varieties, budgie likes and

"Patrick McCrossan, Lillooet Secondary School student, personal interview, 13 Dec. 1999.

dislikes, as well as links to other sites.

Students seem to enjoy learning the material because they can develop their skills by researching something of their own choice.

"You learn everything about technology, but get to apply it to something you're interested in," McCrossan says.

A quick walk around the classroom, however, illustrates that although students are quiet and working on something they're interested in, it doesn't mean they're necessarily doing their school work. Two girls have pulled up a Web site on the Backstreet Boys and quickly minimize the screen when they realize an adult has noticed what they're doing. A boy is playing solitaire, but doesn't bother to hide it.

Paul Hangle, an English teacher at Lillooet secondary school, appears to fall somewhere between White and Belland when it comes to using computers in his classroom. Hangle, a teacher since 1992, relies heavily on the computer-generated marking system -- to the extent that he lost a week's worth of marks that he hadn't backed up on paper the week before Christmas when the computer system went down. Although he was busy re-collecting assignments to re-enter marks in the system, he basically shrugged his shoulders at the loss. The benefits, he says, outweigh the potential problems.

Computerized marking systems allow teachers to print out up-to-date marks anytime they want. They can send marks to parents multiple times before mid-terms, for example, without taking the time to write up reports.

"You (don't) write anything out, but they see it -- black and white scores," Hangle says.¹⁰

The same process works with students. Hangle says he's shown students their marks

¹⁰Paul Hangle, Lillooet Secondary School teacher, personal interview, 15 Dec. 1999.

whenever they've asked, and it has served as good intrinsic motivation: they know where they are, and how that compares to the class average.

Hangle also has a mini-network of eight computers set up in his classroom, which is unique in the school.

The computers are there mainly for students to write with -- they can type in a draft paper, make revisions and print out a good copy. With word processors, Hangle says, students are more willing to make changes to their assignments -- which means they improve their editing skills.

"If they just write it, you get back the same thing two times in a row," he says.

The fact that there are just eight computers in a class of about 24 doesn't present as many problems as some people might think, although Hangle says he'd like to have one computer for each student.

"Everybody works at their own rate. There will be a backlog on the first day to get on the computers, and after that no one's at exactly the same spot."

To date, Hangle hasn't transformed his classroom into a paperless one. Nor has he been able to use the computers as more than a word-processing tool, even though he'd like to include Internet lessons in his activities.

"I tried it for a little while, but it's just too cumbersome, too slow," he says. "The connection is too slow right now."

Students have run into the same problems when trying to find information online.

"Four or five kids will try, and two or three will be successful," Hangle says.

And when they do go online, it presents its own problems.

"They don't know how to differentiate between what they need and what they're getting," Hangle says.

Sir James Douglas Elementary School

When 72-year-old Bea McCreight volunteered to help a Sir James Douglas Elementary School student with a school project, she thought she'd be sharing some of her knowledge of the past. She didn't think she'd make a new friend.

But since meeting Grade 6 student Sarah Aitken for an interview about a treasured object from the past in September 1998, McCreight has received a Christmas card and a couple of letters from the student.

"The girls are just wonderful," says McCreight. "It is just absolutely great to be with young people like that who are so enthusiastic."¹¹

McCreight was one of 29 Fairfield New Horizons seniors to volunteer for the Sir James Douglas project, called Generations CanConnect. The purpose of the Industry Canada program is to connect youth and seniors through the Information Highway, but the project has connected some of its participants in even more ways.

"I made a pen pal," says Grade 6 student Robyn Hasted, of the relationship she's developed with senior Fran Conacher.

The project began in the fall of 1998, when students at the Victoria, B.C. elementary school contacted the seniors and interviewed them about a treasured object they owned. Students photographed the object and wrote a 150-250 word profile of the senior and the object. Once all the interviews were completed, the photos and profiles were scanned into digital form. The information was published in traditional book form, as well as on the school's Web site in 1999.

The eight students who took part in the project were part of teacher Kathy Martin's "challenge class" for gifted students. Students in the class the year before had developed a Web site for the school, and Martin says the second project built on the first.

¹¹Bev Wake, "Generations connect through Internet," Victoria News 26 May 1999: 5.

"It was wonderful. The computer program and the use of the Internet are something we've been working on," she says.

In addition to computer skills, however, students also learned about their past. Many of the treasured objects were old and some, like the one brought in by McCreight, the students had never heard of before. McCreight's treasured object was a "cat's whisker radio," which is the earliest radio ever invented. As McCreight explains, it was made with coils of copper. A fine wire and crystal inside the device enabled it to pick up radio signals. If you bumped it even slightly, she says, the movements would be out of sync and it would no longer work.

"It was neat," she says. "That was our entertainment."

"It was really neat learning about everyone's treasured objects," Aitken says, adding McCreight's was probably the most unusual.

"The kids really loved this. They were really excited," says Sir James Douglas librarian Judith Reid, adding the seniors seemed just as excited. "Almost all the seniors took the Web site address."

Fairfield New Horizons coordinator Debby Meed says the seniors who took part in the project would likely do it again. "The members, the seniors, enjoyed it," she says. "They enjoyed coming to the school and interacting with the students."

Generations CanConnect is designed to tie directly into school curriculum in areas like social and cultural studies, computer and multimedia skills, language arts and voluntary service. Industry Canada expects that, as more schools log on, Generations CanConnect will produce a major historical, cultural and educational resource to be used by teachers, students, and anyone with an interest in the past. The program is endorsed by heritage agencies, seniors associations and educational organizations.

While Generations CanConnect is designed to bridge the generation gap, other initiatives aim to bridge physical distances.

Developed in Victoria, the Amazing British Columbia Archives Time Machine is one step in that direction. The B.C. Archives Web site has been available on the Internet since October 1998. The Time Machine features 11 galleries covering a range of history topics drawn from the Ministry of Education's kindergarten to Grade 12 social studies curricula.

Visitors to the site are welcomed with a picture of a time machine -- enter, and years flash by as visitors are transported to 11 different eras in B.C. history, all of which are studied by students in social studies classes. They can journey along with characters like Billy Barker and other early prospectors seeking gold in the Cariboo. Visitors can also learn about First Nations and their cultures, the contributions of women to B.C., or the province's top artists, while visiting virtual art galleries.

Written history is accompanied by photos, with hundreds of internal links. While reading about the Gold Rush, for example, one can click on the words James Douglas to learn more about the former premier.

Such a program, says Denis Simair, manager of educational technology for the Greater Victoria school district, is of tremendous use to teachers who can spend hours of their time trying to find appropriate resources and then link those resources to the curriculum. Sending students to the computer room to do their own searches poses problems, Simair says, because there are many inappropriate sites on the Internet. And while there are commercial organizations -- such as Compas for Schools -- that try to identify appropriate sites for educators, narrowing those sites down into sites that tie into curriculum is time consuming.

"They'll say it's good for junior high science students, but it's tough to link that with

curriculum.” Simair says.¹² “This one here is very focused on B.C. curriculum, which is nice... A resource like this that ties in so directly (to the curriculum) makes it much more viable as a resource in the classroom.”

Assembling the Time Machine wasn't easy. Walter Meyer zu Eerpen, manager of corporate access initiatives for B.C. Archives, says assembling the Web pages involved preliminary research at the archives, consultation with the Education Ministry to make sure what was being put together tied into the curriculum, and that the language used was appropriate for the reading levels of the students it was aimed at. The site was created by B.C. Archives, SchoolNet Digital Collections, Industry Canada, B.C.'s Ministry of Small Business, Tourism and Culture, the B.C. Ministry of Education and members of B.C.'s teaching community.

Brentwood Bay Elementary School

Bright paintings and neatly-written assignments line the walls, and Laurie Acorn points out some of his favourites, obviously impressed with the work his students are doing. The vice-principal at Brentwood Bay Elementary School, located in the Saanich School District a short drive from Victoria, Acorn has worked at the school in one capacity or another for 30 years.

He is eager to give a tour of the school, including a stop at the computer lab.

On the way to the lab, he stops by a small room near his office. There are a half-dozen iMacs in the room, just removed from the boxes which are still on the floor. The school, which has a large number of First Nations students, had just received \$20,000 from a First Nations group to buy six iMacs and a digital camera, Acorn explains.¹³

¹²Bev Wake, “Students being given the chance to time travel as B.C. Archives plugs in its new Time Machine,” Victoria News 16 Oct. 1998: 5.

¹³Laurie Acorn, Brentwood Bay Elementary School vice-principal, personal interview, 10 Dec. 1999.

The larger computer lab, filled with older Macs, is located in what used to be known as the "small gym." The gym had previously been used by students in the younger grades, but today all students use the large gym or take physical education classes outdoors. Most schools at the primary level in B.C. let students go into the lab once a week, while at the Grade 3-5 level, students use the lab two to three times a week for composing and creating.

Though Acorn was obviously impressed with the student work that brightened the hallways, upon entering the computer lab his enthusiasm seems to reach a new level. Perhaps that's because his skills with the computer aren't any better than many of his students -- and in some cases are worse -- so that he's genuinely impressed with what the students accomplish.

Teacher Tim Lampard, who spends one-fifth of his teaching time in the computer lab, shows with a few clicks of the mouse how computers are used at Brentwood Bay Elementary.

Some Grade 4 students have just completed Hyper Studio projects, which were shared with parents at a school gathering. The students created a "pretend trip" to Pender Island - a small island between Vancouver Island and the mainland -- which they will visit in a real camping trip later in the year.

Other students were working with a program called "Avid Cinema," which enables them to import text, audio, video and still pictures to make their own movies.

"We're just in the formative stages," says Lampard.¹⁴

Still, it's obvious why teachers are impressed with the results. Lampard pulls up a short movie designed by a 10-year-old boy in Grade 5. He's not a great student as far as marks go, Lampard explains, but he excels in the computer lab. His movie was inspired

¹⁴Tim Lampard, Brentwood Bay Elementary School teacher, personal interview, 10 Dec. 1999.

by a new car his mother had purchased. He designed a Chrysler ad with the computer program in about three hours.

The program is snappy and flashy, getting its message across in a succinct and entertaining way.

"The creativity is immense," Lampard says. "I can't see anything else I can do at school that's as creative as this."

Students, he says, seem to be inspired by computers -- particularly the emphasis on the visual. With digital cameras, for example, students are able to take photos, instantly see what they look like and upload them onto the computer. If they take enough photos, students can create computer slide shows.

"They take it, it's instantaneous, and students want to write about it," Lampard says. "The dynamics of picture taking makes students want to write."

Students can also draw pictures with computers, and once again, Lampard says, it seems to make once-boring writing assignments dealing with topics like summer vacations a little more exciting for students. But the benefits go beyond making activities more fun.

"Fun's not the right word," Lampard says. "There are lots of activities that are fun. I get upset when I see people coming in here and it's like a 20-minute play time . . . Even for primary students, they can play at home. At school, we should be teaching them the new technology."

When used properly, Lampard says, computer work helps build problem-solving, language arts, visual arts, layout, and planning skills, while encouraging group work.

As of yet, connection at Brentwood Bay Elementary is too slow to allow students to use the Internet in a meaningful way, but Lampard expects that to change. And he says the change is for the best.

"With the Internet, students can go anywhere in the world to access stuff," he says.
 "I'm really convinced it can be really good."

COMPUTERIZED CLASSROOMS: FOR BETTER OR WORSE

Battling plagiarism, pornography and other pitfalls

Roger Lauzon, a Grade 12 student at Lillooet Secondary School, says people who believe computers help students learn are right.

"I know personally and for my little sisters that are in elementary school. I find it's a lot easier to learn things on these programs rather than from a teacher standing up at the front of the class," says Lauzon, who's taking a senior drafting course in which much of the work is done on the computer.¹⁵

"It's self-directed and at your own pace," he says.

Using word processing in English classes, he says, also makes it easier for students to catch mistakes with spell check. With cut and paste commands, he adds, students are more likely to edit and revise their essays.

English teacher Paul Hangle, who has eight computers in his classroom at Lillooet, says students are more likely to take risks with their writing when they use word processors -- and learn in ways that may otherwise not have been possible.

"It improves their spelling," Hangle says by way of example. "They might be spelling a word wrong their whole life because no one's ever caught it. This tells them right away and they see how to spell it. It helps their vocabulary too, because they're willing to use words they don't know how to spell because they know they'll learn how to spell it later."

But such technological advances, he says, require teachers to change their marking

¹⁵Roger Lauzon, Lillooet Secondary School student, personal interview, 14 Dec. 1999.

schemes.

"My expectations have changed," he says. "If it was written, some spelling stuff you'd let go, but now they shouldn't have the spelling mistakes. For some students, it's definitely helped. You can see the difference when something's been word processed. It's night and day."

While Lauzon says word processing programs have improved his writing skills, his own comments cast doubt on the amount of knowledge he's acquired in the process. He may have mastered computer skills, but what did he learn?

For a recent project on B.C., for example, he says he cut and pasted much of the information in the report from Encarta 98 and the Internet. He rewrote a bit and designed a title page, but admits that he "actually didn't read everything that was in there."

Cheating on assignments -- or plagiarism -- isn't unheard of in schools.

A column in *Forbes* magazine in May 2000, pointed out that there are dozens of Internet sites that sell term papers on any subject. The article then quotes a student at one of New York City's elite public high schools, who said: "A lot of people download papers and just change the names. There aren't a lot of original papers that get written anymore."¹⁶

Hangle admits plagiarism does occur, and computers may make it easier -- but in his experience students usually get caught.

"I have had computer-related plagiarism, and had students print out the same assignment with different names," Hangle says. "But it's pretty easy to catch -- certain students are going to do that and you know who to watch."

Some times it's easier to catch than others. In a social studies class Hangle was teaching, he had a couple of assignments handed in that had been downloaded directly

¹⁶Diane Ravitch, "The great technology mania," *Forbes* 23 March 1998 (<http://www.forbes.com/98/0323/6106134a.htm>).

from the Internet. It was easy to prove -- the students hadn't taken the URL address off the bottom of the page.

For the most part, however, Hangle says assignments are usually so specific that students wouldn't be able to download essays directly from the Internet.

And, as Paul Belland says: "As teachers, you need to design projects properly so it doesn't leave that door open."

For example, it wouldn't be wise for physical education teachers to ask students to explain the rules of soccer, he says. Asking students to design a new game based on soccer and rugby rules instead would allow them to show and apply their knowledge of the rules of both games in a creative and original way.

Such information would not likely be available on the Internet, Belland says.

Students at Lillooet aren't able to unknowingly "borrow" ideas from their friends either, because every student has his or her own number to log onto the computer with, as well as their own secret password, so no one can access their assignments.

But what about all the other kinds of information students can access when using computers at school?

According to a U.S. survey of students who have unintentionally downloaded pornography from the Internet, 22 per cent downloaded it at school. Of students who have intentionally downloaded porn, 16 per cent did so at their school Internet site.¹⁷

Another report suggests that Internet terminals in schools and libraries are being used to access pornography and other sexually-explicit material approximately four times every minute.¹⁸

Although no students were observed downloading porn in Ottawa, Lillooet, Victoria

¹⁷Donna Rice Hughes, Kids Online: Protecting Your Children in Cyberspace (Grand Rapids, MI: Fleming H. Revell, 1998) 161.

¹⁸Donna Rice Hughes 163.

or Brentwood Bay, according to Roger Lauzon it's a lot more common that teachers might realize.

Take that project he did on British Columbia. All he had to do was type the words "B.C. Pictures" into a search engine, and he was greeted with a list of porn sites.

There are inappropriate sites on the Internet, admits Paul Belland, although he says accessing such sites "hasn't been a big issue" at Lillooet Secondary School. The school doesn't use "Net Nannies" or other programs that allow inappropriate sites to be blocked, because Belland says they aren't foolproof.

"In B.C., the philosophy is if you're going to offer something it has to be 100 per cent reliable," he says. "You just need to educate your kids."

Brentwood Bay Elementary School's Tim Lampard says the same approach is taken at the elementary school level.

"You talk to students about pitfalls, and teach them to be responsible," he says.

Belland says it's just like teaching them about inappropriate magazines in stores -- if students stumble across a pornography site, you ask them to back out. Like many schools, however, the computers at Lillooet secondary school all have log files which keep track of which student is using the computer, what the student is logged on to and at what time.

Assisting Administrators

Just as students can use the Internet as a resource, so can staff.

Jim Coombs, principal of Broadmoor Junior High School in Sherwood Park, Alberta, says computers have made certain administrative duties more efficient.

Like most provinces, Alberta's school systems have undergone "forced amalgamation" over the past decade, designed to make them more cost-effective.

Broadmoor Junior High is now part of the Elk Island Public School System, which with

38 schools and more than 15,000 students is the fifth largest in Alberta. From Broadmoor, Coombs says, the system extends "70 miles in one direction and 70 miles in another."

All that talk within high-tech industries about the Internet conquering the barriers of geography, Coombs says, applies in his school system. All schools in the district are connected through an internal communication network -- similar to e-mail but accessible only by computers connected to the internal network -- so teachers with computers in their classrooms can communicate with one another online at any time.

"Technology, in terms of internal communication, has allowed us to speed up the communication between schools, particularly now that we're a larger district," Coombs says. "Mail service would only be not weekly, but bi-weekly, you know what that's like."¹⁹

And the phone system, Coombs says, has never been an effective means of communication for teachers.

"Certainly at a school, getting a hold of someone on the phone can be difficult, and not always convenient," Coombs says. "Hooked up like we are within the school for internal communication, I can send a message to any one of the other classrooms."

Though Coombs's school is small -- it serves 30 students with severe emotional behaviour problems in Grades 7 through 9 -- the same system is used throughout Alberta, varying only slightly from district to district. The same holds true for most of the country.

In the Ottawa-Carleton school district, the district-wide e-mail program is called BEAM. Mutchmor Elementary School principal Barbara Campbell agrees the program facilitates communication -- but says it's not entirely positive.

"Within the school, computers make the work much, much easier," she says. "But

¹⁹Jim Coombs, Broadmoor Junior High School principal, phone interview, 30 April 2000.

within the board, the e-mail system needs to be more streamlined.”

With three e-mail boxes, Campbell says she’s often inundated with mail with no time to read it all.

“It’s frustrating,” she says. “People are less picky about what they send, and I find the amount is too much. (BEAM) has made communication much too easy, so you’re getting bombarded with too much information. It’s difficult to determine what is crucial, what is important, what’s necessary and what’s not.”

Campbell does see potential cost savings in e-mail communication systems down the road. She says she plans to talk to the school council at Mutchmor about setting up an e-mail system so the school can communicate with parents at home. To date, however, paper communication could not be done away with entirely since there are still quite a few children whose parents don’t have computers at home.

Teachers’ tools

As Brookfield High School teacher Gordon Kubanek in Ottawa says, the Internet can be a tremendous resource for teachers. That was one of the hopes behind the federal SchoolNet program. Run through Industry Canada, it aims to connect all Canadian classrooms to the Internet by March 2001. Listed as one of its objectives on the SchoolNet Web site is the desire to “enhance educational opportunities and achievements in schools across Canada by making national and international resources available to learners and educators, regardless of geographical locations.”

In addition, SchoolNet funds various programs that can help teachers. The GrassRoots Program, for example, provides funding to teachers who create innovative, interactive projects on the Internet. Once the projects are posted on the Internet, teachers across the country can embark on similar projects using resources already proven effective by other

teachers.

Government online programs aside, there are numerous other resources available online.

Lillooet Secondary School English teacher Jeanette White says she goes online every time she teaches a new novel and types the name into a search engine. Invariably, she says, the search will find a number of lesson plans that she can use or adapt.²⁰

However, according to Ross Mutton, president of the Association for Media Technology and Education in Canada, it can take up to 10 times the time to prepare a lesson using computer technology than without it.

"It's not the using that takes time, but the creation of the material," he says. "It's an incredible amount of work to do it in the first place."²¹

The time demands can be just as consuming for teachers hoping to find educational software or Web sites to incorporate directly into lessons. Much of what's available is junk -- and finding the valuable educational material can take time. Classroom teachers who reviewed 1,123 pieces of educational software for the California Instructional Technology Clearinghouse between 1996 and 1999, for example, rated only 15 per cent of the products as exemplary.²²

"That is a strong statement that there is a limited number of high-quality educational products," says clearinghouse director Bridget R. Foster.²³

Lack of knowledge is also a problem, says Brentwood Bay Elementary School vice-principal Laurie Acorn.

²⁰Jeanette White, Lillooet Secondary School teacher, phone interview, 21 Nov. 1999.

²¹Ross Mutton, Association for Media Technology in Education in Canada president, personal interview, 20 March 2000.

²²Mary Ann Zehr, "Screening for the Best," Technology Counts '99 (<http://www.edweek.org/sreports/tc99/articles/screening.htm>) 3-4.

²³Zehr 4.

"There may be all sorts of lesson plans on the Internet, but we need to know that -- nobody knows that," he says.

Brookfield's Gordon Kubanek agrees.

There are roadblocks that make it difficult to incorporate computers into lesson plans, he says, including lack of training. Teachers in Ontario get just one professional development day each year in which they have a chance to build on their teaching skills in whatever way they choose. If teachers want to use computers in their lessons, he says, they will often have to figure out how to do so on their own time.

"I do this because I want to," Kubanek says. "This is what I do in my free time. A lot of teachers do it because they want to, not because the government tells them to. That's what motivates us."

Kubanek, however, insists there are plenty of resources available for teachers who want to learn. EDEN Project lessons, for example, include a section on how teachers should use the lessons. There is also a virtual staffroom on the EDEN Web site, where teachers can chat with each other for support.

"You don't need a book -- you don't need a library," Kubanek says. "The way the course uses the Internet is how I learn and do everything these days."

Denis Harrigan, principal of Victoria High School in British Columbia, offered a list of what he considered to be the most useful Web sites for teachers: www.fno.org, www.iste.org, www.eschoolnews.org, www.tcpd.org and www.realworld.org.²⁴

- www.fno.org is a Washington State based site called From Now On. At the site, teachers can access the latest issues of *The Educational Technology Journal*, which includes articles on various issues to do with technology in education. In January 2000, for example, the journal's two feature articles were entitled "The New Library in the

²⁴Denis Harrigan, Victoria High School principal, e-mail interview, 8 March 2000.

Wired School.” which looked at how libraries are evolving as the Internet becomes a more important source of information, and “No Free Lunch on the Internet.” which analyzed the type of information available online. The second article cited various studies before concluding that while there was some valuable information online, what is available is still limited by issues of accuracy, reliability, organization and value, while some valuable information is only available at a cost. The Web site also includes a list of technology books, videos and articles that would help teachers, links to virtual museums, and articles and links to information about how teachers can use technology in their classrooms:

- The Oregon-based International Society for Technology in Education can be accessed online at www.iste.org. The site includes links to books, articles and workshops. Topics are broken down into various categories -- such as professional development, teacher resources and research topics -- which educators can choose from. Click on teacher resources, and you’ll be transported to a long list of subtopics from which to choose: jobs, grants, books, distance learning, geography, higher education, languages and literacy, lesson plans, music, networks and organizations, newsletters, planning and advice, policy and legislation, references, science, software and hardware, sponsors and funding, student projects, training and professional development, and more sources. From there, teachers can click on lesson plans, to be taken to a screen with links to Web sites that focus on special subject areas -- like the arts or science:
- www.eschoolnews.org is a U.S. Web site based in Maryland, which contains a wealth of information for educational professionals. It is a news source for teachers, with news stories on issues that would effect how technology is delivered in the classroom -- such as bandwidth and copyright issues. Among other things, it also boasts an education technology literature review, a list of conferences and events, and what it calls the “best

stories” about K-12 school technology:

- www.tcpd.org, the Thornburg Center, would likely be more useful for administrators. According to the Web site, the Thornburg Center is “the premier source of presenters and staff developers in the field of emerging technologies and their impact on learning at all ages.” In addition to pictures, names and contact information of presenters, the site also includes numerous reviews of books written on technology and education;

- Based in California, “Learning in the Real World” at www.realworld.org is more skeptical about the benefits of computers in schools than some of the other Web sites. Its home page includes a short essay on its rationale, concluding in part that “until more data is available, the best choice may be to leave our options open.” It has links to a list of readings, most of which caution against abruptly transforming the education system to revolve around technology. As an organization, Learning in the Real World makes research grants to university investigators to develop, analyze and distribute information which will allow people to make rational decisions about when and where education technology is a positive tool for children and when it detracts from their development.

There are other sources available online as well -- like CBC4Kids, which can be accessed through cbc.ca. The Web site is produced by the Canadian Broadcasting Corporation, and is aimed specifically at children aged eight to 14.

“CBC4Kids was designed as a safe, entertaining, educational site for young people,” according to the teachers’ guide posted on the site. “When you and your students visit our site, you’ll know that whatever they find there will be appropriate for youth. We provide safe, appropriate links and search tools, as well as search tips for you and your students. You’ll need these, because the Internet is like a library the size of Calgary’s Saddle Dome and Toronto’s SkyDome all in one -- with no librarian, no organized shelves of books.

and nothing to tell you what's worth exploring and what is trash."

The site includes six main subject areas for teachers to explore: news and sports, a science lab which includes weekly news and quizzes, language and writing, music, history and a kids club which includes games and discussions. The information on the site is designed to tie into curriculum. Writers reviewed the curricula across Canada to find elements that apply to all provinces and territories before putting the site together.

Another example of an online resource is the Community Learning Network (CLN), run through the Government of British Columbia's Open Learning Agency. The network provides anyone who visits it with an abundance of information. Examples include a page on education resources on the World Wide Web for students and teachers in K-12. (<http://www.cln.org/subjects.html>) CLN breaks the resources down into 18 specific subject areas, which range from aboriginal studies to media literacy to physical education to fine arts. Within each subject area, resources are further broken down into curricular resources (which contain information for students and teachers wishing to learn more about a subject), instructional materials (which link to lesson plans and teaching tips and ideas) and theme pages (which combine the two).

Another CLN page is titled "Integrate the Internet into the Classroom." (<http://www.cln.org/integrating.html>) This page features links to various sites, including a compilation of about 100 experts willing to answer e-mail questions from students, educational listserves, Internet projects, and links to school web pages.

CLN also has a listserv, which can be helpful for teachers who subscribe. Listserves are electronic mailing lists used to deliver messages to the e-mail addresses of people interested in particular topics, like technology and education. The e-mail updates, sent monthly, include URL addresses of Web sites that would be of use to teachers. The *CLN Update* for Nov. 29, for example, included addresses for a Plagiarism Theme Page.

(<http://www.cln.org/themes/plagiarism.html>) which was created by CLN in response to a request from a visitor to the CLN Web site. It also included links to various social studies and science resources (including a chemistry site that offers six “affordable” chemistry demonstrations suitable for high school students), and a Web site that includes a registry of more than 3,800 online schools from 50 countries.

The *Update* also included a large number of lesson plans, available through SMILE (Science and Mathematics Initiative for Learning Enhancement). SMILE includes 800 lesson plans in biology, chemistry, physics and mathematics. The *Update*, however, also includes a caution to readers that “since there is a wide number of authors who have contributed to the (SMILE) database, the detail and quality of the lesson plans will vary.”

Because the quality and detail of what’s available online does vary, it leaves much of the work up to individual teachers who, as Mutton says, will initially spend about 10 times the amount of time incorporating these types of lessons into their classroom activities than they would traditional lessons.

There is also evidence that suggests the majority of teachers today may not have the extra time they need to search the Internet for lesson plans and modify them so they’d work in their classes. Or the time to search for software such as Threshold 21, which they would not only have to learn how to use, but learn it to the extent that they could then teach it effectively to students.

Nor is there evidence to suggest they’ll have more time on their hands in the near future -- especially not in Ontario. In May 2000, the Ontario government introduced legislation which would increase teachers’ workloads, by making the supervision of extracurricular activities mandatory. Earlier in the year, the government outlined a proposal which would require teachers to teach seven courses a year instead of six. The Ontario teachers’ union responded with threats of a job action that could range from a

work-to-rule campaign to a strike.

The Ottawa-Carleton local of the Ontario Secondary School Teachers Federation said the changes would cause teachers to be overloaded, likely bringing an end to field trips and special projects.²⁵ It would also likely make it more difficult for teachers to find time to incorporate new technologies into classroom activities.

Classrooms have changed over the past decade, creating a situation where teachers may have more responsibilities than they have had in the past. Larger classrooms, a resulting increase in the number of special needs students, an influx of English as a second language students, changes in curriculum and technological demands have all contributed to a growing list of teacher responsibilities.²⁶

As Dr. David de Rosenroll, an educator at the University of Victoria's department of psychological foundations in education, says: today's teachers are not only educators, they're expected to be counsellors, career advisors, psychologists and technological experts as well. And the many hats they wear may be too much handle.

"We're seeing an increase in teacher burnout as a result of the pressures," de Rosenroll said as early as October 1997.²⁷ "The more responsibility one has and the less control one has, the faster the burnout will take place."

Brookfield High School's Gordon Kubanek says teacher may face more challenges than they have in the past, and agrees that classrooms have changed. About 20 per cent of students today are special needs students, Kubanek says, due to the fact they are immigrants, gifted, suffer from Attention Deficit Disorder, or just have trouble adjusting because they've moved around a lot.

²⁵Dave Rogers, "Angry teachers raise spectre of strike," Ottawa Citizen 11 March 2000: C1.

²⁶Bev Wake, "Change challenges teachers to the extreme," Victoria News 8 Oct. 1997: 5.

²⁷Bev Wake, "Burnout increasingly plagues teachers in the classroom," Victoria News 8 Oct. 1997: 5.

But Kubanek says it's precisely because of the changing faces of today's classrooms that teachers should give computers a try.

"There's a lot of kids who don't fit the mold, so the mold is like broken basically," he says. "If you just have this (belief) that this is the program I deliver and everybody's going to meet it, well it ain't going to happen. This is not the world we're living in."

"Without tools like this, and there are others, you end up saying here's a Black Model T -- I'm Henry Ford and I know best," he says. "Well, that's gone but a lot of education is still stuck in that."

CHAPTER TWO

Back to Basics: The Evolution of Education

On Sept. 6, 1966, educators and broadcasters from Canada and abroad gathered in St. John's, Nfld. for a four-day conference on educational television. The atmosphere at the conference was one of optimism, reflecting a belief that television could potentially transform and improve the education system.

Dr. L. J. Griffiths, from Strathclyde University in Glasgow, Scotland, was one of several experts to speak about the benefits of educational television. Griffiths argued televisions should be set up in each classroom, along with a single camera with a television monitor for the teacher, monitors that the class could view, and a VCR. He estimated it would cost about \$6,000 to equip each classroom.¹ The benefits? According to Griffiths, they were obvious.

The biology teacher in the past would probably have worked with small groups of five or six students at a time, asking them to look into his microscope, telling them that the specimen shown is what should be seen in their own microscopes after they adjust them. But with television, even with a cheap system, one can show the specimen to large classes at one time. Thus a whole lesson can be conducted much more economically in terms of manpower... with television you can deal with a large number of students. You can bring them into a classroom and cope with them with fewer teachers than would normally be required... Furthermore, this is a very efficient method of teaching.²

If the arguments sound familiar, they should. They are similar to arguments currently being made about the benefits of computers in the classrooms, especially by science instructors high on the potentials of computerized labs. Today, most people would recognize that, while television can enhance learning in some cases, watching labs on television is not the same as watching a teacher perform a lab -- or conducting actual labs

¹Lewis Miller, ed., Educational Television Conference in Newfoundland and Labrador 1966: An abstract of the proceedings (Ottawa: Queen's Printer, 1967) 105.

²Miller 105.

themselves. Though a student would manage his or her own mouse in a computerized lab, it may not be that much different from a televised lab as the action is still taking place on screen. To date, such labs are still void of the smells and sensations of heat or cold that occur during actual, rather than virtual, experiments.

"How different is this current enthusiasm (for computers) from the surge of interest in instructional television three decades ago or in classroom radio and motion pictures over half a century ago?" asks Larry Cuban, a professor of education at Stanford University and a former school superintendent.

"The superficial similarities between periodic gushes in enthusiasm haunt conferences on educational technology like Marley's ghost. The similarities in claims, media interest, and investment are too vivid to simply brush aside as cynical mumblings from Neanderthal educators."³

Since television first made its way into classrooms, the negative potential of television has also been discovered. John Condry highlights just one of the problems in his book *The Psychology of Television*, in which he argues that television has come to be viewed as disruptive for the skill of reading for those who are still learning to read.

Condry cites a 1977 study, presented at the Canadian Psychological Association annual meeting in Vancouver, which claimed Grade 2 and 3 children's reading scores correlated inversely with the amount of television available -- reading skills were highest when children had no TV, second with one channel and lowest with multi-channels. After TV was introduced where it hadn't been, two years later reading scores had deteriorated significantly. A further study by Jerome and Dorothy Singer of Yale University found a decrease in skills that are important to imagination and creativity with TV watching.⁴

³Larry Cuban, "The Promise of the Computer," Social Issues in Computing: Putting Computing in its Place, eds. Chuck Huff and Thomas Finholt (New York: McGraw-Hill Inc., 1994) 523.

⁴John Condry, The Psychology of Television (New Jersey: Lawrence Erlbaum

The promised world?

As arguments made about the benefits of educational television in the 1960s suggest, today's hype about technology in classrooms isn't new. But despite predictions and promises, television never did come to dominate the classroom.

Will new information technologies be any different? Should they be?

Visions of today's classrooms do attempt to make up for the shortcomings of television. Whereas television is considered a passive medium that merely delivers information to students, computers are considered interactive, requiring students to search for information.

Massachusetts Institute of Technology (MIT) professor Seymour Papert explains the benefits of computerized learning in his 1992 book *The Children's Machine: Rethinking School in the Age of the Computer*.

"Traditional education codifies what it thinks citizens need to know and sets out to feed children this "fish," he says. "Constructionism is built on the assumption that children will do best by finding ("fishing") for themselves the specific knowledge they need; organized or informal education can help most by making sure they are supported morally, psychologically, materially, and intellectually in their efforts."

Papert's philosophy is similar to that espoused by Brookfield High School teacher Gordon Kubanek, who in the spring of 2000 conducted a pilot project at his Ottawa school in which a group of 11 students studied chemistry online.

"Anytime you can give them a sense that they're in control of their learning, they eat it up like little puppies," Kubanek says of his students. "They love that, because they want

Associates, Inc., 1989) 16.

⁷Seymour Papert, *The Children's Machine: Rethinking School in the Age of the Computer* (New York: Basic Books, 1992) 139.

to be in charge -- in a controlled fashion."

Papert has promoted computer-enhanced learning since the 1970s. Working at MIT, Papert developed a computer programming language called Logo, which is used to teach programming to children. The key feature of Logo is turtle graphics, which enables children to make simple drawings by telling the "turtle" on the screen to move in certain directions. Once children master the program, they can move on to more complex programs."

From the time they were invented, Papert believed the stimuli-response programs would catch on because they would create an active environment in which children would participate in their own learning -- building on what they already know through a process of discovery."

Papert further argued that computers allow children to process knowledge as they discover it.

"When knowledge is doled out in tiny pieces, one can't do anything with it except memorize it in class and write it down in the text," he says.' "When it is embedded in a context of use, one can push it around and fix minor bugs..."

Logo and turtle graphics, however, never managed to revolutionize education -- although they are used in American and some Canadian middle schools and high schools to this day.

According to Lillooet Secondary School science teacher Mike Kennedy, who now promotes computers in education, those programs discouraged teachers like him from trying computers.

"Logo," Microsoft Encarta 98 Encyclopedia, 1993-1997.

'Cynthia Solomon, Computer Environments for Children: A Reflection on Themes of Learning and Education (Cambridge, MA: The Massachusetts Institute of Technology, 1986) 12.

'Papert, The Children's Machine 63.

"People always thought I was down on computers," says Kennedy. "I wasn't. I was down on mindless computing. Turtle graphics -- what a joke."

Today's computers, however, are certainly more evolved than the stimuli-response and drill programs of the early years. Computer technologies are now being used in education in a number of different ways including: information access, multimedia presentations, drill and practice, communication with students, teachers and experts, distribution of educational services, and learning about technology through exposure and use."

"Applications such as e-mail, multimedia communication, and the Internet -- like the printing press before -- are not just better black or white boards," writes William H. Dutton, the American author of the 1999 book *Society on the Line: Information Politics in the Digital Age*. "They are changing the way we do things."¹⁰

Or at least, they are changing the way policy makers want things to be done in Canadian schools.

But technological advances are just one factor that influences changes in the education system. Just as some teachers today are restructuring classrooms to incorporate technology while others rely on more traditional methods of instruction, there have always been debates about how children can best be educated. Today, the debate is also shaped by the idea that children, reared on the latest technologies, require a different education than children did in the past. Educational choices are also influenced by changes in the larger society -- such as the current transformation from the industrial age to the information age. At the same time, the education system is also shaped by the history and underlying goals of education, including the belief that education is a public

¹⁰William H. Dutton, *Society on the Line: Information Politics in the Digital Age* (New York: Oxford University Press, 1999) 205.

¹¹Dutton 204.

good. Finally, government policies and strategies -- including the call for "Back to Basics" education -- also shape the type of education Canadian students receive.

COMPUTERIZED CLASSROOMS

New kinds of kids

Patrick McCrossan answers questions so politely and quietly he appears almost hesitant, but his voice is convincing as he talks about the information technology course he's taken during his senior year at Lillooet Secondary School in B.C. He may have decided to take it only because he needed another course at the Grade 12 level, but he hasn't regretted the decision.

"You learn everything about technology, but you get to apply it to something you're interested in," he says of the course. Plus, he's learning how to use technology he'll likely need to know once he's finished high school

"Most people will be using computers in their jobs, so it's important," he says.

With acne dotting his cheeks, and an apparent habit of avoiding eye contact when speaking with adults, McCrossan may seem the stereotypical teen, at least outwardly. Others would argue McCrossan's opinions make him the stereotypical teen -- period. And while McCrossan likes the course because he gets to learn about something he's interested in, a problem may arise if students like him learn only what they're interested in.

British Columbia's information technology 11 and 12 courses were implemented in September 1997. Students who take the course are expected to master computer hardware, software and accessories. By the end of the course, they should also have acquired a multimedia approach to communication, and be capable of integrating text.

graphics and audio into computer presentations.¹¹ That part, students seem to enjoy.

As McCrossan's classmate Courteney Adolph says, she could have taught herself the computer Internet language HTML or how to add graphics to text, but it's easier to learn it in a school setting where the equipment is right in front of you and you're being shown how to use it.

"You can't just read it, computers really have to be hands-on," she says.

But the information technology course has another component in which students are expected to demonstrate an ability to draw conclusions about the impact of multimedia communications on society.

It's this society and technology part of computer education that social critics such as Neil Postman, an author and professor at the University of New York, claim is so important to students. As early as 1996 Postman wrote that computer education alone was absurd, because 38 million people had already learned how to use computers without the benefit of school.¹² He says what people really need to learn is not how to use technologies, but how technologies use them.

In the case of cars, what we needed to think about in the early 20th century was not how to drive them, but what they would do to our air, our landscape, our social relations, our family life, and our cities. Suppose that in 1946, we had started to address similar questions about television: what would be its effects on our political institutions, our psychic habits, our children, our religious conceptions, our economy? Wouldn't we be better positioned today to control television's massive assault on culture?¹³

Postman says students should be asked questions about the effects of media -- such as whether computers limit or expand opportunities for freedom of expression and whether they create a global village or encourage people to revert to tribal identities. Otherwise,

¹¹British Columbia, Information Technology 11 and 12 Integrated Resource Package 1996.

¹²Neil Postman, The End of Education (New York: Vintage Books, 1996) 43.

¹³Postman 44.

he says, students are “apt to be unaware of the fact that there are serious arguments being made about the advantages and disadvantages of their media-made world, and they are entitled to be informed about and heard on the matter.”¹⁴

This society and technology component, information technology teacher Paul Belland says, is also what students seem to have the most trouble with -- even though he tries to make it more entertaining by incorporating videos into the curriculum.

Courteney Adolph doesn't even remember the component. With prompting, Patrick McCrossan says he does remember it, but didn't do well.

“I didn't pay attention,” he says. “I watched the movie, but it was pretty boring. I couldn't write the essay, because I didn't (pay attention).”

MIT's Seymour Papert says because children today grow up in an atmosphere in which information is always provided in interesting ways -- on television or computer screens -- they expect all learning to be fun, a truth that takes hold as soon as children start school.

“Children who grow up with the opportunity to explore the jungles and the cities and the deep oceans and ancient myths and outer space will be even less likely than the players of video games to sit quietly through anything even vaguely resembling the elementary-school curriculum as we have known it up to now!” he says.¹⁵

Further, Papert says computer-enhanced education gives children power over their own education, a power they're used to exerting over TVs and computers, and this enhances their desire to learn.

“School has an inherent tendency to infantilize children by placing them in a position of having to do as they are told, to occupy themselves by work dictated by someone else and that, moreover, has no intrinsic value -- schoolwork is done only because the

¹⁴Postman 142.

¹⁵Papert, The Children's Machine 9.

designer of a curriculum decided that doing the work would shape the doer into a desirable form.” he says.¹⁶

Even if students aren’t working on their own individual computers, education can be made both more entertaining and practical -- answering the demands of a generation reared on TV and video games.

Microsoft founder Bill Gates outlines his vision of modern classroom lectures in his book *The Road Ahead*. Computers, he writes, allow teachers to select pictures, stills, or videos from a comprehensive catalogue of images on the information highway. They could put together a visual show, with images and diagrams appearing at appropriate times. If a student asks a questions, they can pull up animated graphics to answer.¹⁷

Social critics like University of New York professor Neil Postman argue this need to be entertained plagues society as a whole. He says North Americans in general are obsessed with entertainment over content.

Today, we must look to the city of Las Vegas, Nevada, as a metaphor of our national character and aspiration . . . for Las Vegas is a city entirely devoted to the idea of entertainment, and as such proclaims the spirit of a culture in which all public discourse increasingly takes the form of entertainment. Our politics, religion, news, athletics, education and commerce have been transformed into congenial adjuncts of show business, largely without protest or even much popular notice. The result is that we are a people on the verge of amusing ourselves to death.¹⁸

According to Postman, the result of this obsession is that “we are getting sillier by the minute.”

Not everyone agrees that entertaining information is necessarily silly. Nor is it

¹⁶Papert, *The Children’s Machine* 24.

¹⁷Bill Gates, *The Road Ahead* (New York: Penguin Books, 1995)189.

¹⁸Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (New York: Penguin Books, 1985) 10.

¹⁹Postman, *Amusing Ourselves to Death* 24.

necessarily bad that students prefer to learn information that will be of practical use in the future. However, while the intelligence of youth shouldn't be underestimated, is it not an overestimation to assume students are capable of determining what work is of intrinsic value? Is it giving too little credit to curriculum designers to say the projects they design are of no value? Shouldn't students be required to learn some information they might find boring and, just as importantly, learn patience and persistence by working through assignments they may not find particularly interesting? And do entertaining lectures really improve learning?

What underlies the responses to many of these questions is the belief that students are not only demanding a different type of education today, but also need a different type of education to function properly in modern society. They are used to television sound bites, clips of information, information enhanced by visuals, and self-directed learning. In addition, they have grown up with television and computers -- and expect such innovations to be incorporated into classroom lessons.

Education enters the Information Age

Kids aren't the only ones changed by innovations in technology. So too is society. And, according to government officials, students need a different type of education to prepare them for the new, knowledge-based society. That's one of the reasons why governments across Canada are spending money to computerize schools, and why the federal government established the SchoolNet program, which plans to link all classrooms to the Internet by 2001.

"The Internet is a powerful technology which learners are going to be exposed to the rest of their lives," says Doug Hull, director general of Industry Canada's Information Highway Applications Branch. "And they're going to be working in organizations where

that skill is going to be expected and it will be a fundamental skill for employment. So not to expose learners to information technology may be the real mistake.”²⁰

Ken Osborne, a former educator and professor emeritus at the University of Manitoba’s education faculty, describes current education policy thusly:

Today, education in all parts of Canada is being turned into an instrument of economic policy. An Ontario report in 1987 described education as “the paramount ingredient for competitive success in the world economy” and as crucial “for our very survival as an economically competitive society. It is a view that now dominates education policy . . . From now on Canadians’ prosperity and standard of living will increasingly depend on high-tech, knowledge-based jobs, on the application of high levels of skill, and a willingness to adapt and adjust to the changes of the global economy. The future, therefore, depends on education, on a skilled and flexible workforce, comfortable with sophisticated technology and eager to face uncertainty and change, ready to define risk as challenge and opportunity. Ministries of education take this argument very seriously. Throughout the 1990s they have been telling schools that they should concentrate on preparing students for the new global economy.”²¹

The federal government has held such beliefs since at least the early 1990s. It was the premise held by members of Canada’s Information Highway Advisory Council when they began research in 1994 for their report *Preparing Canada for a Digital World*. The council’s premise was unchanged three years later, when it published its final report.

As the 21st century dawns, Canada and the world are making a profound transition that reaches into every aspect of human life. A new knowledge society is replacing the industrial society that prevailed in the developed world during most of the 19th and 20th centuries. This transformation is fundamental, and our success in making this transition will determine our success as a nation and as individuals in the 21st century. It will determine whether we as a people can achieve those economic, social and cultural goals that make us Canadian. It is urgent that Canada moves quickly and wisely to accelerate that transition. This conviction animated the Council’s work when it began three years ago. Now, as it ends, this conviction remains our central conclusion.”²²

²⁰Doug Hull, interview. The Wired Classroom Canadian Broadcasting Corporation. cbc.ca: April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

²¹Ken Osborne. Education: A Guide to the Canadian School Debate - Or, Who Wants What and Why? (Toronto: Penguin Books Canada, Ltd., 1999) 18-19.

²²Canada, Industry Canada. Preparing Canada for a Digital World: Final report of the

One way in which governments can make the transformation is by restructuring the education system and wiring it to meet the requirements of the information age.

As Doug Hull says, the government is trying to build a more innovative economy, and to do so it needs more "brain power." The best way to create the "brain power" is to expose students to information technology.

"If you do that enough in society and the education system, it will breed a generation of knowledge workers entirely different than previous generations," he says.²³

One can see how recent education policies have mirrored Hull's belief:

- The first objective of Canada's SchoolNet program is to: "stimulate learning and produce a school graduate population with a strong command of information and telecommunication technologies, which are key employability skills in the new global knowledge-based economy."²⁴

- The rationale behind British Columbia's provision of multimedia and information technologies to students and teachers is explained as follows: "It has become clear that those best able to use computer-based information will be the most successful in achieving their social and economic goals. The new information technologies (computer networks, telecommunications, multimedia) will define not only how, but how well, we will live. The education system plays a key role in helping students to acquire the skills necessary to live, work and learn in a society that increasingly relies on these technologies. If students are to be prepared for the future, the priorities of education must be aligned with the overall direction of society. The public school system has an important role in preparing students to make effective contributions as citizens in a

Information Highway Advisory Council (<http://www.strategis.ic.gc.ca/SSG/ih01647e.html>) 8 Oct. 1997.

²³Doug Hull, cbc.ca.

²⁴Canada, Industry Canada, Canada's SchoolNet (<http://www.schoolnet.ca/home/e/info/mission.html>).

technological society.”²⁵

- In Manitoba, the government says: “technology has the capacity to cross borders, close distances and overcome time. It can revolutionize education by providing more choices, better library resources, access to information and expertise from around the world. It can give students the opportunity to develop the computer skills they will need for the job market.”²⁶

Even among educators who support the addition of computers to classrooms, however, there are some who are wary that current changes are being driven to too great an extent by the new conditions in the larger culture.

“The public has been sold a bill of goods saying your kids need technology,” says Lillooet Secondary School teacher Paul Belland. And technology, he says, isn’t always the answer.

But the emphasis Canadian governments and schools have begun to place on technology in education, including connection to the Internet, is not unusual in developed countries.

According to Thérèse Laferrière, of Laval University’s School of Education and the TeleLearning Network of Centres of Excellence, most countries are now developing plans to introduce information and communications technologies to education. The process of development in North America and the European Community is being explored in places like the northern provinces of South Africa, Mexico and Israel. In the United States, it’s estimated that the “edutainment corporations” -- which create entertaining, educational software -- are investing \$250 billion in “value-added learning activities” which could be sold to other countries. That figure amounts to almost five

²⁵British Columbia, Provincial Advisory Committee (PACET), Rationale 26 Jan. 1999. (<http://www.k12techplan.educ.gov.bc.ca/pacet/rationale.html>).

²⁶Manitoba, Making Technology Work for You (<http://www.merlin.mb.ca/merlin/whatis/making.html>.)

times the annual education expenditures of all the Canadian provinces, including the federal government contribution.²⁷

As in Canada, there are people in other parts of the world questioning the emphasis governments are placing on technology. In Germany, for example, Christian Democratic Union member Jurgen Ruttgers, a former minister for technology under Helmut Kohl, launched a regional election campaign for the CDU with the phrase: "More education, instead of immigration." Ruttgers was aiming to mobilize opposition to government plans to invite 20,000 foreign computer experts into Germany to fill a gap in technological expertise, when the money could be better used elsewhere.²⁸

The debates, at least in part, do seem to be an acknowledgment of the increasingly important role information technology has come to play in society.

Statistics do paint an interesting picture of the modern communications era.

According to U.S. Department of Commerce statistics released in April 1998, more than 50 million people were already using the Internet, just four years after it went public, making it the fastest growing technology of all times. It took the radio 38 years to acquire 50 million users, while it took TV 13 years to reach that mark. Having said that, however, the U.S. population more than doubled during that same time period to about 275 million from 106 million.

Statistics Canada figures suggest that since the late 1980s, personal computer use has risen to more than 45 per cent in society as a whole, while Internet use has grown to almost 25 per cent from zero since the early 1990s. This explosion in computer use has led some mass communication researchers to proclaim a new era, which has been dubbed the information age. According to some communication theorists, like Berkeley professor

²⁷Thérèse Laferrière, Towards Well-Balanced Technology-Enhanced Learning Environments: Preparing the Ground for Choices Ahead (<http://www.cmec.ca/reports/infoteche.stm>) Revision: 28 Oct. 1997.

²⁸Toby Helm, "Party branded "Haiders of the Rhine," Ottawa Citizen 3 April 2000, A8.

Manuel Castells, the new era has the potential to break the divide between humans and machines. "fundamentally altering the way we are born, we live, we learn, we work, we produce, we consume, we dream, we fight, or we die."²⁹

Castells says the information age is at least as major a historical event as the Industrial Revolution, reshaping the material basis of the economy, society and culture. The transformation, he argues, will be pervasive. Schools, it then follows, need to keep up with the change or Canadians -- and the country as a whole -- will be left behind.

According to German mass communication theorist Jurgen Habermas, as the concept of the information age comes to take on more power, so too do the driving forces behind it: science and technology. The progress of science and technology then come to be viewed as the most important variable upon which economic growth depends.³⁰ Students, it would therefore be argued, must be prepared to enter the technological workforce when they graduate, in order to succeed in the new economy and keep the economy strong.

"In the 1960s there were a lot of jobs, students could leave school in Grade 10 or 11 and no one worried too much," says the University of Manitoba's Ken Osborne. "There were semi-skilled jobs that were often unionized and you could make a decent living. This is no longer the case. Today there is a demand on government to ensure that industry is provided with a suitable workforce."³¹

Today, the jobs are also rumored to be in the high-tech field. An article from the Reuters news service, published in the *Toronto Star* in May 1999, is just one example of the proliferation of the view that computer education is essential. Reporter Andrea Orr proclaimed that "you can't run a company unless you know something about running its

²⁹Manuel Castells, The information age: economy, society and culture (vol. 1) (Malden, MA: Blackwell, 1996) 33.

³⁰Jurgen Habermas, "Technology and Science as Ideology," Jurgen Habermas on Society and Politics, ed. S. Seidman (Boston: Beacon Press, 1989).

³¹"A learning experience," The Globe and Mail 28 Sept. 1999 C1.

computers.” She then quoted Haim Mendelson, a professor at the Stanford University Graduate School of Business, to prove her point.

“One of the core messages we are trying to convey is that there is no clear-cut distinction between the technologists and the general managers,” said Mendelson, who teaches a course on management in the information age. “Technology is so important today it could really destroy you if you don’t deploy it properly.”¹²

In 1993, a presidential task force in the United States reported that the number of jobs requiring computer skills had increased to 47 per cent of all jobs from 25 per cent in 1983. By 2000, the report estimated, 60 per cent of the nation’s jobs would demand computer skills -- and pay an average of 10 to 15 per cent more than jobs involving no computer work.”

Many jobs do require computer knowledge and given the proliferation of e-businesses run online, many jobs will likely continue to require computer skills. However, predicting what type of workers will be needed in the future is never easy. The argument that education should be geared toward meeting the demands of the high-tech industry, University of Manitoba’s Ken Osborne says, may be inappropriate.

“The argument ignores the reality that the greatest increase in jobs today is occurring not in high-tech industry but in the unskilled and semi-skilled, low-wage, service sector,” he says. “It also ignores the reality that technology is not taking us into a paradise where everyone will be highly skilled and educated, happily changing jobs at regular intervals and, when they cannot find a job, confidently creating their own. Rather, it is taking us into a world where a minority of people will have challenging, rewarding and well-paid work, but where the majority will find themselves de-skilled and engaged in work, often

¹²Andrea Orr, “Schools teach managing in Internet Age,” The Toronto Star 14 May 1999.

¹³Todd Oppenheimer, “The Computer Delusion,” The Atlantic Monthly June 1997, 54.

part-time, that has already been programmed for them.”⁴

There is evidence to support Osborne’s argument. In May 2000, C.D. Howe Institute analyst Finn Poschmann predicted severe labour shortages in the future. While the booming technology sector has strengthened the economy, Poschmann said a shortage of skilled trades workers already has the country scrambling to find people to build high-tech workplaces and provide services for their employees.⁵

Experts are also predicting shortages in the automotive industry and service industries like restaurants, as well as in professional fields like nursing and teaching.

Furthermore, not everyone is convinced that computer skills will guarantee success in the information age.

A 1998 study by University of British Columbia labour economist Robert Allen, for example, found that “university graduates in humanities and social sciences have a better chance of finding jobs, moving up the corporate ladder and ending up in professional or managerial positions with higher pay; those who graduate with specific skills from technical and vocational programs start their careers with higher pay and better positions but stagnate in their thirties and forties. The difference lies in what an arts degree gives students: analytical abilities and good reading, writing and basic computer skills.”⁶

Some people go so far as to say that an emphasis on the Internet as a learning tool will hinder the development of analytical abilities in students.

“Want fast, cheap information? Log onto the World Wide Web. It’ll travel down the Internet’s pipeline as fast as your modem and the network servers. The Internet is the McDonald’s of information,” writes Berkeley lecturer Clifford Stoll, an astronomer and

⁴Osborne 19.

⁵Jeff Pappone, “Shrinking skill pool threatens living standards,” Ottawa Citizen 6 May 2000 D1.

⁶Donald Gutstein, e.con: How the Internet Undermines Democracy (Toronto: Stoddart Publishing Co. Ltd., 1999) 205.

MSNBC commentator. "And like McDonald's, the Internet delivers a product which is fast, easy, and cheap. Like McDonald's, it's plenty good enough for many people -- it satisfies their needs. And like McDonald's, the Internet drives out classical establishments which deliver high quality. One pushes aside mom-and-pop restaurants; the other undercuts libraries."¹⁷

Catering to the economy...

The emphasis governments appear to be placing on educating students to meet the demands of the information age economy have some people worried that educators are more concerned with creating workers than healthy individuals.

Industry Canada's Doug Hull denies that Canada's education system is catering to the demands of industry.

"We're not just producing cannon fodder for the industrial process, we're building new citizens better able to cope in modern society," he says.¹⁸

In any event, throughout history education systems have been shaped by changes in society, technology and the economy. In this respect, computers are no different in their potential to transform the way students are taught.

In 1965, *A Social History of Education*, by Robert Holmes Beck, outlined the history of education dating back to the ninth century B.C. The book illustrates how changes in society are often followed by a restructuring of the education system.

In the fourth and fifth centuries BCE during the transformation from an oral culture to an alphabet-writing culture, for example, the Romans opened grammar schools. Such schools were also scattered throughout Western Europe, although they were

¹⁷Clifford Stoll, High Tech Heretic: Why Computers Don't Belong in the Classroom and Other Reflections by a Computer Contrarian (Toronto: Doubleday, 1999) 188-89.

¹⁸Doug Hull, interview, The Wired Classroom Canadian Broadcasting Corporation, cbc.ca: April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

predominantly associated with religion and entrance was limited by money.

The development of the printing press in the 16th century also transformed the way education was delivered. Citizens needed not only to be able to memorize, recite and debate, they now also needed to be able to read. Once again, however, educational opportunities were limited by money, and generally tied to religion.

During the era of exploration, the first steps were made towards public education. According to Beck, it was in the English colonies dotting the eastern seaboard of the United States that the concept of public education first gained credence.

"For the Puritans of Massachusetts Bay, education was a vital portion of their religion," he writes. "Illiterate men could not read the gospels and Protestantism demanded that each man read and know the scriptures."³⁹

It wasn't until the 19th century, however, that universal public schooling -- organized and funded by government -- first developed. Even then, researchers like Beck and the University of Manitoba's Ken Osborne argued that public education wasn't created because people saw its inherent value. Instead, it largely evolved due to the coming together of three powerful forces: industrialism, nationalism and democracy.⁴⁰

According to Osborne, industrialists saw schools as a way to train workers, while nationalists saw education as a way to create patriotic citizens. In its democratic version, education was key because "if working men and, eventually, women, were to be allowed to vote and to take part in public affairs, then they should at least be able to do so intelligently. Education was necessary if democratic citizenship was to be a reality."⁴¹

It was during this move towards compulsory education that the guiding ideals behind education also evolved. In 1913, the superintendent of Winnipeg schools said that the

³⁹Beck 47.

⁴⁰Osborne 5.

⁴¹Osborne 7.

traditional educational goals of culture and mental and intellectual discipline were no longer enough.

“In the new world of industry, nationalism and democracy, education had also to produce in children a sense of civic duty, a patriotic spirit, good health and preparation for jobs. In other words, schools existed to train citizens.”⁴²

The benefits of public education were seen to extend beyond the individual, benefiting society as a whole by conferring universal economic benefits while helping improve the general character of society and the quality of economic and social decisions.⁴³

Today, public education is provided free to all Canadian citizens and permanent residents until the end of secondary school, normally age 18. And, in Canada, there is little that is valued as highly as the public education system -- one based on equity that provides all children with an education no matter their economic situation.

“The philosophy is similar to that which underlies our worship of Medicare,” says Robin H. Farquhar, a public administration professor at Carleton University in Ottawa.

Equal opportunities in a computerized world

Just as the printing press, exploration and the Industrial Revolution prompted changes to the education system, so too are computers. There's a belief that if computers are going to be a key component of the new information age, then all students must be prepared to use them -- just as all students needed to be able to read if they were to participate in a democracy. These beliefs tie into the concept of education as a public good, designed to provide all student with the same access to basic skills and therefore basic opportunities.

⁴²Osborne 9.

⁴³A. Peacock and J. Wiseman, “Principles of Educational Finance in Developed Countries,” Economics of Education 2, ed. M. Blaug (New York: Penguin Books, 1969) 349-352.

While home computers grow more common each day, computer use -- and particularly Internet use -- is still far from ubiquitous. According to Statistics Canada figures, 45.1 per cent of Canadians had a home computer in 1998, the last year for which statistics are available. That's almost double the percentage of Canadians -- 24.8 per cent -- who could access the Internet from home.⁴⁴

The desire to plug this gap ties into the goals of public education. If computers are to play a major role in society, all students should have equal access to them in order to have equal opportunities once they graduate from secondary school.

But just because all students have access to computers in schools, it doesn't ensure they will enjoy the same experiences or opportunities. Even if all assignments are to be completed during class time, for example, students who have computers at home are likely to be farther ahead in their skills than their classmates. They also have the luxury of practising what they've learned -- Web site design, for example -- at home. Their peers do not have this opportunity because, unlike traditional resources such as library books, computers can not be signed out and taken home for the night.

Heather-jane Robertson, the director of professional development services for the Canadian Teachers' Federation, says arguments which link computers in the classroom to equality of opportunity are misleading.

"The assertion that technology, unlike any other valuable educational, social, or economic resource, will be distributed freely and equally, or even applied to equal benefit, is either naive or blatantly manipulative... Technology doesn't beget equity -- it begets excuses to sell more technology, but only to those who can pay for it, one way or the other."⁴⁵

⁴⁴Statistics Canada, Selected dwelling characteristics and household equipment 1999 (<http://www.statcan.ca/english/Pgdb/People/Families/famil09c.htm>).

⁴⁵Heather-jane Robertson, No More Teachers, No More Books: The Commercialization of Canada's Schools (Toronto: McClelland & Stewart Inc., 1998) 195.

The cost of computers may continue to decrease, but they will also continue to be a luxury some Canadians can't afford, particularly when one factors in the cost of software and Internet access at a workable speed.

In 1996, nearly 1.4 million children 15 or younger were living in low-income families, representing about 22 per cent of Canadian children. U.S. studies suggest the development of an ever-widening digital divide, in which high-income households in urban areas are more than 20 times as likely as rural, low-income households to have Internet access.⁴⁶

This digital divide suggests another divide could also develop, since studies have also consistently linked income levels to success in schools. According to Statistics Canada, in 1994 about one-third of people aged 18 to 21 from low socio-economic backgrounds had not completed high school, compared with about one-quarter of those from higher socio-economic backgrounds. Between 1986 and 1994, while university participation rates rose for people from all socio-economic backgrounds, the increase was smallest for those from low socio-economic backgrounds.⁴⁷

Even if computers were ubiquitous, there is still some evidence that would suggest funding Internet access through programs like SchoolNet may benefit some students more than others. As the Council of Ministers of Education Canada point out in *Developments in Information Technologies in Education*, a report prepared for the 13th Conference of the Commonwealth Education Ministers in Botswana in 1997, the Internet is an English-language phenomenon.

While there is relatively little Canadian content on the Internet, the situation is even worse for Francophone Canadians. French may be the second most popular language on

⁴⁶Media Awareness Network, Digital Divide Widens (<http://www.media-awareness.ca/ENG/ISSUES/STATS/usenet.htm>).

⁴⁷Statistics Canada, "Education Indicators" The Daily 21 Feb. 2000 (<http://www.statcan.ca/Daily/English/000221/d000221a.htm>).

the Internet, but French-language content is estimated at only three per cent of all Internet content, compared with 91 per cent in English. The situation could be presumed worse for other Canadians. In the Northwest Territories almost 40 per cent of households speak neither official language, speaking instead a variety of native languages.⁴⁸ Aboriginal students have also traditionally struggled in the education system. In 1996, 42 per cent of the Aboriginal working-age population had less than a high school education, compared with 22 per cent of the non-Aboriginal population.⁴⁹

If the underlying philosophy behind public education is to remain during the transformation to the information age, it is issues like equity that must be monitored as classrooms are computerized, says Carleton's Robin Farquhar. He says it's important to ensure that information and communication technologies are perceived as a tool and a vehicle to enrich people's learning, employment prospects and quality of life -- not as a panacea.

"It has some dangers that must be understood by teachers and parents," he says. "Access and content aren't guaranteed successes, and attention must be paid to these issues."

GOVERNMENT POLICIES

Federal architects, provincial engineers

There are numerous governing bodies which influence the way technology is used in education -- and are capable of monitoring the use of technology and implementing

⁴⁸Council of Ministers of Education, Developments in Information Technologies in Education 1997 (<http://www.cmec.ca/reports/edtech-en.stm>) 32.

⁴⁹Canadian Educational Statistics Council, Education Indicators in Canada: Report of the Pan-Canadian Education Indicators Program 1999 (Feb. 2000) 96.

changes in the way it's used.

That's because in Canada, education is a provincial responsibility.

The Constitution Act of 1867 sets out that the legislature in each province may "exclusively" make laws in relation to education. The federal government is responsible only for the education of registered Indians and Inuit people on reserves, education and training in the Armed Forces, Coast Guard and correctional services, and funding education in the territories, although each territory manages the delivery of educational services.

Decentralizing power, Farquhar says, can be beneficial. For example, each province conducts a review of education every 10 years. It's expensive, but he says it's also a worthwhile luxury because the information acquired improves the overall system.

"When you're reinventing the wheel you make it rounder, smoother, better," he says.

Farquhar says the federal government is conscious of this jurisdiction limitation.

"The federal government is extremely nervous of having anything to do with education, because they're nervous of provinces going to war, led by Quebec -- and they don't want to go to war with Quebec," he says.

However, Farquhar says the federal government does have limited powers in education and can sometimes get around provincial jurisdiction. For example, the federal Millennium Scholarship Program put money into the hands of individual students rather than post-secondary institutions -- bypassing provincial discretion as to how the money would be distributed. The feds called the shots on how that money was to be distributed, Farquhar says, and they decided it would be made according to need rather than other factors like grades.

Further, the federal government also has the power to develop what Farquhar calls education "architecture" and infrastructure. They did this with SchoolNet, the Industry

Canada program which connected every Canadian school to the Internet in 1999 and aims to connect every classroom in 2001. SchoolNet is a federally funded program run in partnership with the provinces and territories, the private sector and non-profit organizations.

"It's really a collaborative issue," says Rachel Roy, programs spokesperson for SchoolNet.⁵⁰ "Education is a provincial jurisdiction, so this is an exciting challenge. I think it's really government at its best."

Each province, however, has the ability to determine how the architecture and infrastructure, in this case Internet connection, is used. This can vary from province to province, Farquhar says, according to commitment and wealth.

Power is further delineated within each province with local decisions being made by school boards.

Provinces determine the "what" that is to be taught, explains Nick Scarfo, an official with the Ontario Ministry of Education. School boards determine how technology is distributed, while teachers determine how it will be used to teach the "what" mandated by the province.⁵¹

"School districts have flexibility in the programs they deliver through local spending decisions," agrees Rick Withers, an educational technology branch manager with the B.C. Ministry of Education.⁵² That flexibility includes spending on various programs, Withers says, adding that some districts in B.C. spend three times what is spent in other districts on technology.

School boards, however, haven't wielded as much spending power as they once did

⁵⁰Rachel Roy, SchoolNet programs spokesperson, phone interview, 21 Feb. 2000.

⁵¹Nick Scarfo, education officer, curriculum assessment and policy branch, Ontario Ministry of Education, phone interview, 19 May 2000.

⁵²Rick Withers, manager, educational technology branch, B.C. Ministry of Education, 23 May 2000.

since provinces throughout the country -- Saskatchewan and Manitoba excluded -- have removed the rights of boards to tax residents as a supplement to provincial funding. In New Brunswick, school boards have been eliminated entirely. Now, boards in the majority of provinces must rely solely on provincial funding, more than 90 per cent of which is targeted, and try to top it up through fund-raising and public-private partnerships.

Carole James, vice-president of the Canadian School Boards Association, says the most important issue for trustees today is trying to regain some autonomy for school boards, and in so doing give provincial governments less control over how money is spent.

"Right now you have to live with what the government gives you -- and they're tightening their belts," she says, adding school boards in most provinces have discretion over how about three to four per cent of their education budget is spent."

"That's more and more the norm across the country," she says.

Canada is not unique in having such a multi-layered education system with delegated authority -- Australia and the United States have similar systems. But Canada's system isn't typical.

"It's unique in the degree to which the federal government lacks any real power or authority," Farquhar says.

Canada is set apart in that there is no unified federal agency for education -- no ministry, no office, no spokesperson. It makes international conferences interesting, because at some there will be one delegate representing 10 billion people from India and 11 representatives of Canada's 30 million people, one from each province and one federal authority.

"Carole James, Canadian School Boards Association vice-president, phone interview, 7 May 2000.

But, says Farquhar, provinces tend to co-operate with each other, rather than compete.

One way in which provinces are able to co-operate is through the Council of Ministers of Education Canada (CMEC), established in 1967 as an arm of the provinces. Provinces may bring different interests to the table, but the organization bills itself as a national voice on education. While acknowledging in most of its publications that policies differ from province to province, CMEC reports suggest provinces also have a lot in common.

In the Joint Ministerial Declaration of September 1999, the ministers unanimously reaffirmed their responsibility for providing leadership in education at the pan-Canadian level through the CMEC.

“While the provinces and territories remain responsible for education in their jurisdictions, there continues to be a need for joint action,” the declaration read. “We believe that our collective will to work together will create a synergy that will benefit each province and territory.”⁴

Provinces and territories particularly seem to be on the same page when it comes to the emphasis they place on preparing students for the workforce and the role information technology will play in this preparation.

As CMEC’s *Report on Education in Canada 1998* explains, “the main feature of our era is the speed and magnitude of these changes, led by explosive growth of new information and communications technologies. Change is occurring so rapidly that the recent past sometimes seems like ancient history. Thirty years ago, an auto mechanic needed only a sound knowledge of engine systems. Today’s mechanics need the same knowledge, but they must also have the skills to use computerized diagnostic equipment to repair cars. An automobile now has greater computer power than the spacecraft that

⁴Council of Ministers of Education Canada. Joint Ministerial Declaration: Shared Priorities in Education at the Dawn of the 21st Century Sept. 1999 (<http://www.cmec.ca/reports/victoria99.en.stm>)

carried astronauts to the moon in the 1960s and 1970s.”⁵⁵

LESSONS ON LEARNING

Why do we teach the way we teach?

Education is shaped by more than economics and changes in society -- it's also influenced by shifting pedagogical beliefs.

Carleton's Robin Farquhar may have graduated from Victoria High School more than 40 years ago, but he's never left the field of education. The education system, however, has changed a lot since he began his career. In fact, he says Canada has already experienced two pedagogical extremes during his time as a teacher.

"There's a pendulum that goes back and forth, and reflects itself in the philosophy underlying education, and in the organization and even curricula of the institutions themselves," Farquhar explains.

In recent history, the pendulum has swung from the progressive education models of the 1960s, to today's cry for "Back to Basics."

Progressive education became popular in the 1960s, with its goal of helping students develop their potential in whatever way suited them best as individuals. It was developed partially in response to the more regimented system of the 1940s and 50s, in which schools were being asked to prepare students for careers in the industrial world. Schools of the day were based on factory models, and students were sometimes referred to as products. Students were sorted into categories, such as vocational and college preparatory.⁵⁶

In the 1960s, however, earlier teaching strategies came to be seen as conformist and

⁵⁵Council of Ministers of Education Canada, Report on Education in Canada 1998 (<http://www.cmec.ca/reports/rec98/texend.htm>) 3.

⁵⁶Linda Roehrig Knapp and Allen D. Glenn, Restructuring Schools with Technology (Needham Heights, Mass: Simon and Schuster Company, 1996) 8.

authoritarian. Teachers, it was argued, were teaching “irrelevant and outdated curricula to bored and apathetic students.”¹³ Education reports in both the United States and Canada pointed out the problems. American writer Charles Silberman wrote a best-selling critique, *Crisis in the Schools*, which claimed schools had become mindless, with regimented curricula, traditional teaching methods, and a general failure to meet students’ needs.¹⁴ In 1968, Ontario’s Hall-Dennis Report criticized schools for similar reasons, recommending:

the lock-step structure of past times must give way to a system in which the child will progress from year to year throughout the school system without the hazards and frustrations of failure. His natural curiosity and initiative must be recognized and developed... These and other innovations will be aimed at developing in the child a sense of personal achievement and responsibility commensurate with his age and ability, to the end that going to school will be a pleasant growing experience, and that as he enters and passes through adolescence he will do so without any sudden or traumatic change and without a sense of alienation from society.¹⁵

This subsequent move to progressive education, Farquhar says, led to the decentralization of schools and huge choices for students -- often with little direction.

“All students probably weren’t ready, at that level of maturity, to do that,” Farquhar says.

Still, throughout the 1970s, 1980s and 1990s, the philosophy persisted. As early as the 1980s, however, Farquhar says a backlash against progressive education had developed. More and more people, he says, started calling for schools to go back to the basics. But the people running the schools didn’t move as quickly or as far as others, including governments, had hoped. The hesitancy was in large part due to the fact that the people who were running school systems -- teachers, administrators and those aligned with

¹³Osborne 13.

¹⁴Osborne 13.

¹⁵Osborne 14.

teacher federations -- were trained under the progressive education philosophy. Farquhar says.

Provincial governments -- particularly under Ralph Klein in Alberta and Mike Harris in Ontario -- dealt with this lack of change on the part of teachers by regaining control of education and redoing curricula themselves. Farquhar says.

"But they're doing this to the great dismay of the teaching powers that be," he adds.

Under the "Back to Basics" rallying cry, schools have swung back to a focus on relevance in education, core programs, prerequisites, streaming and required courses. Back to Basics education is tied closely to getting kids ready for the workforce. Farquhar says, and responds to the demands of employers and parents. It is in this respect that education ties into the information age.

"Information fluency is a good job skill in any part of the workforce," Farquhar says.

Not everyone, however, agrees that Back to Basics education will take students back to the best type of education.

As the University of Manitoba's Ken Osborne says, the disagreement is the latest in a long-standing educational debate: "should schools serve the needs of students or the needs of society, and who decides just what those needs are?"¹⁰

Author and University of New York professor Neil Postman argues against school ties to the workforce in *The End of Education*.

"The making of adaptable, curious, open, questioning people has nothing to do with vocational training and everything to do with humanistic and scientific studies," he writes.¹¹

"At its best, schooling can be about how to make a life, which is quite different from

¹⁰Osborne 15.

¹¹Postman 32.

how to make a living.”⁶²

Farquhar is correct when he says governments have been attacked by some people for taking control of education systems and redoing curricula. Schools are now being criticized for focusing too much on facts and skills, particularly those relating to information technology, while ignoring the humanities. Renowned author and philosopher John Raulston Saul spoke out against the trend in March, arguing the changes overlook what Canadians really need to learn -- their history.

“It will not serve them well over the long term, because that kind of utilitarian training -- with the change in technology every five or 10 years -- it’s all obsolete overnight,” he said. “By training people in this narrow way, you’re training them to be unemployed in the long term. In order to know what to do in society as a citizen, you have to have an understanding of your history. It will even help you in your job.”⁶³

Toronto Star columnist Michele Landsberg has satirized the Back to Basics move in education as reminiscent of the style of the fact-obsessed Mr. Gradgrind, a teacher in Charles Dickens’ Industrial Era novel *Hard Times*.

“We are ruled by an under-educated group of men who really do not understand the life of the mind, the value of education, or the nature of children’s learning,” she asserts. “These New Utilitarians, just like Mr. Gradgrind, see education purely as mechanical memorization and training for jobs.”⁶⁴

But it seems as though students -- like Courteney Adolph and Patrick McCrossan from Lillooet Secondary School -- like the Back to Basics approach, and the fact school work will prepare them for the workforce.

⁶²Postman x.

⁶³Diane Campbell, “Stop ignoring our past, Saul begs” *Ottawa Citizen* 6 March 2000: A1.

⁶⁴Michele Landsberg, “School system a bleak house of cards” *Sunday Star* 18 March 2000: A2.

When Adolph is asked why students should learn about computers in schools, her response is straightforward and simple.

"I believe everybody will need it," she says.

Adds McCrossan: "Everyone should be taught the basics."

To them, computers are not seen as an extra tool -- they are seen as a basic need.

Rick Withers, with B.C.'s Ministry of Education, says technology in today's classrooms has less ties to the workforce than it has in the past. Twenty years ago the emphasis with technology was almost exclusively on vocational skills for computer science or business. Today, he says, the real push is to use technology to support learning in the classroom.

Ontario Ministry of Education officer Nick Scarfo agrees.

Though he says the Ontario government is pushing back to basics education, he says it has more to do with learning basic skills to succeed in life than basic technology skills to succeed in the workforce.

"The assumption is that there is an emphasis on technology," Scarfo says. "With this government, there is an emphasis on literacy and numeracy, and the emphasis on technology is there to assist literacy and numeracy."

Other educators believe computers may allow teachers to combine the best of both educational models -- progressive education, which encourages them to allow students to develop at their own pace in their own ways, and Back to Basics education which prepares them for the workforce.

Brookfield High School chemistry teacher Gordon Kubanek says online instruction, for example, allows students to work at their own pace. This means they won't be frustrated if they fall behind their classmates, and they won't be bored if they're lessons ahead. Further, he says, students become engaged in the learning process because they

aren't being told what they need to know -- they're discovering it on their own.

"It gives them tools to find their own answers," he says.

Kubaneck also concedes, however, that online learning won't work for all students. It's just one tool, he says, and different students learn better with different tools.

Like Kubaneck, Carleton's Robin Farquhar agrees that computers should be incorporated into education. But, also like Kubaneck, he says people need to be wary of their promises.

"A certain healthy skepticism -- with an emphasis on healthy," he says. "It's here, here to stay, and it must be incorporated into the education system. We just have to be smart and use good values as we do it."

CHAPTER THREE

To Computerize or not to Computerize: The Great Debate

Ross Mutton apologizes for the papers scattered over his desk, as he gestures to a vacant chair in his small office on the sixth floor of Carleton's University's Southam Hall. The apology is unnecessary, as the rectangular, brass plate at the edge of the desk, next to the Ottawa Senators notepad, seems to sum up his daily routine: "It's Always Something."

But perhaps that's to be expected, given that Mutton, president of the Association for Media and Technology in Education in Canada (AMTEC) and director of Carleton's Instructional Media Services, deals on a daily basis with what he calls the most significant invention since the printing press -- computers.

Mutton says he's never seen such interest in educational technology, such volume, or such diversified use.

"We're in the middle of some kind of revolution -- it's like the industrial revolution all over again," he says. "Aside from the fact it's totally exhausting, it's very exciting. But it's hard to keep up. In the middle of it, it's hard to keep up."

Likening the evolution of the computer industry to the car industry, Mutton says people have only recently turned in their Model T's in favour of Model A's.

"You don't have to be a mechanic to make the thing work, but it still breaks down a lot," he says.

And while Mutton admits there are times when he'd like to take a hammer to his computer and smash it to pieces, he says there's no turning back in the middle of a revolution. People have computers in their homes, he says, and they want them in their schools too.

"They're demanding it," he says.

Mutton has been promoting technology in schools since well before the Model A

arrived midway through this “Information Revolution.” On Jan. 27, 1994, on behalf of AMTEC, he spoke before the Ontario Royal Commission on Learning. AMTEC, officially founded in 1973 following the amalgamation of three audio-visual associations, was one of just a few groups to speak out about the benefits of technology in schools. While AMTEC spoke about the need for teacher training and support, Mutton says the main thrust of their argument was the need to get technology in schools. The AMTEC presentation concluded that:

The opportunities stemming from technology and communications systems facing us today in education are unprecedented. Technology can dramatically expand both the effectiveness and the reach of the available human resource, improve administrative efficiency, and allow for individual differences without lowering standards. Technology can have a major impact on reaching the at-risk students. Technology, intelligently planned and wisely implemented, can, in the parlance of the street, give us much more bang for the buck.¹

The Ontario government responded by investing more money in technology for the remainder of the decade.

Though the Royal commission was geared towards Ontario’s education system, one of the reasons AMTEC made the presentation was because it felt the recommendations would have national implications. Mutton says. Coincidence or not, schools throughout Canada have computerized through the 1990s, to the extent that classroom activities discussed in *Chapter One* are now the norm.

According to a Statistics Canada survey released in October 1999, there is one computer for every seven students at the secondary level, one for every eight intermediate students and one for every nine elementary students. About one-third of elementary and intermediate students and one half of secondary school students had used e-mail, the survey revealed. In addition, 76 per cent of elementary students, 80 per cent of

¹AMTEC. Report to the Royal Commission on Learning from The Association for Median and Technology in Education in Canada 1994 (<http://www.amtec.ca/rc.html>) 2.

intermediate students, and 87 per cent of secondary students had used external databases to find information. Overall, more than 33 per cent of students had sent information over the Internet, while 30 per cent had designed or maintained a Web site.

The next milestone in the move to computerize classrooms should be reached by March 31, 2001. By that date the federal government expects to connect each of Canada's 250,000 elementary, intermediate and secondary school classrooms to the Internet. There are more than 18,000 schools in Canada, and each school has had access to the Internet since March 30, 1999.

The Statistics Canada study also suggests, however, that despite major strides taken in introducing computers to schools and connecting them to the Internet, education systems face significant challenges as they move towards taking fuller advantage of them. Principals and school information technicians, for example, reported a number of obstacles to fuller use of technology in the classroom -- including a lack of computers and lack of training opportunities for teachers. School principals called for more computers, as well as more time for teachers to prepare courses and explore ways to use the Internet. Information technicians cited lack of software and technical support to maintain the computers as key problems.

The Statistics Canada survey suggests that Canadian classrooms are not yet able to utilize computers in a way that would really make a difference. There are researchers who would agree, saying that Canadian schools have yet to reach a stage where computers can make a significant difference in the way children learn.

As Mutton says, what came out of the Ontario Royal Commission on Learning was money for the technology itself.

"They haven't dealt with the thornier issue of how to make it work," he says.

Other researchers take the debate a step further and argue that computers will never be

the educational tool many within government and education are making them out to be. Some argue, in fact, that computerized classrooms could have a negative effect on the education system and on children. However, the findings of these scholars are debated just as much as those of the advocates.

This chapter will look at how computers are currently being used and the implications thereof. It will then look at some of the obstacles that prevent schools from fully computerizing classrooms, before turning to studies that assess the merits, weaknesses and implications of computer-assisted learning.

COMPUTERS IN THE CLASSROOM

Where are we now?

As the 1999 Statistics Canada survey suggests, Canadian classrooms are far from being totally computerized, with an average of just was one computer for every seven students at the secondary level, one for every eight intermediate students and one for every nine elementary students. Though all schools are connected to the Internet, all classrooms are not expected to be online until 2001.

Case studies in *Chapter One*, in many respects, do reflect Statistics Canada's findings. They also highlight the fact that computers have not been fully implemented into existing curricula or into classrooms. Take Lillooet Secondary School in British Columbia as an example. All offices and classrooms at the school have at least one computer, and that computer has Internet access. There is the odd classroom with two computers, while one classroom has eight. The school has two computer labs with 24 computers each, for a total of about 70 computers.

According to information technology teacher Paul Belland, the situation isn't likely to change any time soon. The school will not get any more computers in the near future.

although it will be able to replace the old equipment. Belland describes the situation as disappointing, particularly since the school had a lab of Macintosh computers it had to get rid of when it merged into a newly-amalgamated school district that favoured PCs. This changeover of equipment is not unusual, as schools become networked, join other school districts, or enter into business agreements with companies that favour one product over another. With just one or two computers per classroom, Belland says, there is little opportunity for students to actually use them in a meaningful way.

"They should be integrated, so you can use technology to do math, English, and social studies," he says.

In Canada, however, the trend has been to park computers in labs rather than regular classrooms. A SchoolNet report, which compared Internet connectivity between Canadian and American schools, found that Canadians schools were less likely than their U.S. counterparts to put computers in classrooms. In Canada, 60 per cent of computers are located in labs at the elementary level, 67 per cent at the intermediate level and 65 per cent at the high school level. Just 14 per cent of computers at the intermediate and high school levels are in classrooms, while 20 per cent of computers at the elementary level are in classrooms. In the United States, almost 50 per cent of computers are located in classrooms.²

Mike Kennedy, head of the humanities department at Lillooet Secondary School, says computer labs are a reflection of misplaced resources and misplaced dollars, and students would be better served by being able to use computers in their regular classrooms.

Kennedy's comments echo the words of Seymour Papert, a Massachusetts Institute of Technology professor and one of the most outspoken proponents of computerized classrooms, who compares the isolation of computers in labs to the body's immune

²SchoolNet. Internet Connectivity Comparison Between Canadian and United States' Schools March 2000 (<http://www.schoolnet.ca/accueil/e/info/comparison-c.pdf>).

response to a foreign intruder: by removing computers from the classroom and placing them in a lab, schools have minimized the potential impact computers can have on children's learning.

With labs, Papert argues, students have access to about 1/50th of a computer in school, far from the level needed for the technology to have a major impact on teaching practices or learning experiences.

The fatal flaw in taking computers out of the classroom is that any information learned about the computers today will be obsolete by tomorrow. Only when computers are integrated into the curriculum as a vital element for instruction and are applied to real problems for a real purpose, will children gain the most valuable computer skill -- the ability to use computers as natural tools for learning.³

Other researchers share this viewpoint. Washington state education researcher Linda Roehrig Knapp and Allen D. Glenn, dean of the college of education at the University of Washington, reached a similar conclusion in their book *Restructuring Schools with Technology*.

For computers to be truly effective in helping students learn to think analytically and solve complex problems, the computer tools -- databases, simulations, graphics, videodiscs, and so on -- need to be available when students are engaged in the processes, not a half hour or a day later. Research shows that computers do help students learn to be more competent writers, researchers, and problem-solvers when they use computers on a daily basis. When they use computers occasionally, students can indeed experience more effective practice environments for learning basic skills and they can also benefit from the teachers use of technology for demonstration purposes. But if they use computers occasionally, they will not be empowered to adopt the computer as a personal tool that is as fully-integrated into their lives as other technology tools like telephones, calculators, cameras, photocopy machines, VCRs, and televisions.⁴

Knapp and Glenn's argument is an interesting one, although it may be weakened somewhat by the context in which it is placed. Telephones, calculators, cameras,

³Seymour Papert, *The Children's Machine* (New York: Basic Books, 1992) 39.

⁴Linda Roehrig Knapp and Allen D. Glenn, *Restructuring Schools with Technology* (Needham Heights, MA: Simon and Schuster Company, 1996) 32

photocopy machines. VCRs and televisions are all examples of technologies that are used in schools, but have been integrated into the majority of Canadian's lives without rearranging the school system. Televisions and VCRs have become teaching aids, while calculators are now standard school supplies. Not everyone, however, agrees that technologies like calculators which make finding answers easier actually help students learn more than they would without them.

Joel Wrinch, a teacher at Lillooet Secondary School, says computers may take the problems inherent in learning technologies like calculators to a new level. He gives as an example a student unable to reduce a fraction of $24/64$. The student didn't know eight could be divided into 24 without a calculator.

"We rely on machines to do our job for us, and it's making kids dumber to be honest with you," Wrinch says. "Kids aren't as smart today as they used to be."

Integration: Beyond the Classroom

The location of computers isn't the only factor that shapes how successfully they are used. Kathleen Wilson and William Tally, researchers with the U.S.-based Education Development Center Inc.'s Center for Children and Technology, argue that in addition to being able to use computers when and where you want to, two other factors influence how effectively computers are used in classrooms. They need to be embedded within the existing curriculum and work with the prevailing pedagogy.⁵

No matter the topic of study -- be it geometry or *Hamlet* -- technology use must serve a larger curricular aim, instead of being an isolated vehicle of learning. Wilson and Tally further argue that computer use should be surrounded by other activities such as group

⁵Kathleen Wilson and William Tally, "Classroom Integration of Interactive Multimedia: A Case Study," CTE Technical Report No. 16, June 1991
(<http://www.edc.org/CCT/ccthome/reports/tr16.html>)

discussion, writing or research using other sources.

In addition, the use of technology must also be integrated pedagogically -- to fit the style of teaching that prevails in the classroom. By way of example, Wilson and Tally argue that a program that approaches Greek history through a computer-simulated archeological dig will be more easily integrated into classrooms where open-ended research projects are the norm, than it will in those where history is approached as names, dates, and events to be lectured about and memorized. Computer use, they argue, must complement teaching strategies to be effective.

Appropriate teacher training, Mutton says, is on AMTEC's agenda. He says teachers need appropriate training so they can use technology in ways that will benefit students. This would mean a move away from training teachers how to use the technology, he says, towards training teachers how to use the technology in pedagogically sound ways.

Carole James, vice-president of the Canadian School Boards Association, agrees.

"Teachers don't need to learn how to use the Internet, but how to teach kids how to think critically when using the Internet."

Reaching the ideal: What are the roadblocks?

Despite studies outlining how computers are best placed in classrooms, they still tend to be located in computer labs, isolated as teaching tools and sometimes working against teaching strategies rather than with them. According to Shelley Goldman, Karen Cole and Christina Syer, with the Institute for Research on Learning in California, there is an explanation for these patterns.

"We know a variety of factors predict whether and how teachers will use technology, including access, training, teaching philosophy, and collaboration with other teachers."

"Carole James, Canadian School Boards Association vice-president, phone interview, 7 May 2000.

they write in "The Technology/Content Dilemma," a paper presented at the 1999 Secretary's Conference on Educational Technology in the U.S.⁷

Unfortunately, as U.S. researcher Andee Rubin explains in "Alternate Realizations of Purpose in Computer-Supported Writing," factors outside the acquisition of technology itself are often ignored by planners and researchers.

It is curious that technology is often viewed as sufficient by itself to effect change. The assumption seems to be that, if only teachers and students had access to the power of new technology, wonderful visions of learning would be realized. This assumption is part of what [computer education expert Seymour] Papert calls *technocentric* thinking. It allows little room for the possibility that traditional practices may be integral elements within a functioning social system, and that they are unlikely to change simply because new practices are technologically possible. In fact, those teachers who do adopt innovations must engage in a complex problem-solving process in which they integrate old practices and new goals.⁸

According to such arguments, teachers play a key role in determining how successfully computers are integrated into classroom activities.

A 1994 report by Janet Schofield, which grew out of a two-year study of computer use at a large urban high school in the United States, found 13 barriers to computer usage in schools:

- a belief that computer usage will add little value to current practice;
- disruption of the classroom's traditional social organization;
- teachers' lack of familiarity with computer hardware and software;
- computer anxiety;
- lack of training;

⁷Shelley Goldman, Karen Cole and Christina Syer, "The Technology/Content Dilemma," The Secretary's Conference on Educational Technology-1999

(<http://www.ed.gov/Technology/TechConf/1999/whitepapers/paper4.html>)

⁸Andee Rubin and Bertram Bruce, "Alternate Realizations of Purpose in Computer-Supported Writing," CTE Technical Report No. 3 February 1990

(<http://www.edc.org/CCT/ccthome/reports/tr3.html>)

- timing problems that occur, for example, with the introduction of computer equipment before the implementation of proper training;
- when training is offered, inability to match training to the teacher's level of knowledge and instructional concerns;
- lack of concentrated experiential training;
- inertia and resistance;
- infrastructure problems, such as access and repairs;
- overload of knowledgeable teachers;
- the lack of incentives and the presence of disincentives, including lack of adequate training and a supportive infrastructure."

In general, Schofield concluded that due to those barriers computers are little used even where they are available.¹⁰ Of the barriers she discussed, four seem to be raised most frequently: inadequate access, lack of teacher training, an aging and reluctant teaching staff and lack of time. The same barriers are still mentioned by teachers, administrators and experts in the field today.

Access to equipment

Mike Kennedy, head of the humanities department at Lillooet Secondary School, has wonderful visions of how he'd like to use computers in his classroom given the opportunity. A social studies and science teacher, who has 27 years of experience and has completed "99 per cent" of a masters degree in curriculum development, Kennedy reiterates the need for a four-to-one student-to-computer ratio. With this ratio, he says, students would be able to pair up and he could "flip-flop" groups of two from the

"Janet Schofield, "Barriers to Computer Usage in Secondary Schools." Social Issues in Computing: Putting Computing in its Place Eds. Chuck Huff and Thomas Finholt (New York: McGraw-Hill Inc., 1994) 556-575.

¹⁰Schofield 551.

computers to classroom activities. Particularly for the sciences, he says, there is an abundance of information available online -- from the U.S. Geological Survey to European weather sites to maps and information on rocks and minerals.

Perhaps the biggest advantage in the sciences, he says, would be the possibilities opened up by virtual labs. The use of Merlin Scientific software, he says, could eliminate a lot of the current problems in science labs by allowing students to work in virtual labs before experiencing the real thing. With virtual experiments, Kennedy explains, students "see it happen." After they've seen it happen, he says, students can then get their ice cubes and Bunsen burners and perform the experiment. Such software would enable students to plug in their findings and get "a type of data they can't get in any other way" as well as "beautiful God-damn graphics." In biology classes, Kennedy enthuses, students could perform frog dissections with simulation, an advance he describes as significant.

"Cutting (the frog) up doesn't encourage the right type of thinking," he says, implying that students shouldn't be asked to work with dead animals.

However, Kennedy says he hasn't been able to transform his classes in the ways in which he'd like because he doesn't have access to the number of computers he needs.

"How do you get adequate numbers and make it fly?" he asks. "It never has... and we've never had the latest generation of anything."

Kennedy says he's applied for funding three times to help reach his goals, and has been turned down each time.

"We can teach without them, but...." he says, pausing and shaking his head. "We need to have top-down leadership."

"There's a tremendous lack of fertilization that would take place if all the levels sat down and figured out what was the best to do with these computers," he says.

"Hopefully, they would listen to those in the classrooms. This is the best possible thing

we could do. Will they do it? Probably not in my lifetime.”

According to Carleton University’s Ross Mutton, the situation at Lillooet Secondary School is typical. Major hurdles to ensuring computers are used to their best advantage at the Kindergarten to Grade 12 level, he says, include lack of connectivity, too few computers and low bandwidth. Bandwidth determines how much information can be accessed over the Internet and how quickly.

“They just can’t get anywhere,” Mutton says, referring to the problems students have connecting to Web sites online.

A 1998 report for SchoolNet by TeleLearning Network Inc. reached similar conclusions.

“Substantial access to online technologies, in terms of both resources and learner competence in making use of them, remains the exception in our classrooms,” the report reads. “Given limited connectivity and access, research results reflecting practical uses of online resources and tools in the elementary and secondary school classrooms are scarce.”¹¹

A September 1999 report prepared for SchoolNet suggests that only five per cent of teachers currently have their students use the Internet to access online resources.¹²

Training

¹¹TeleLearning Network Inc. The emerging contribution of online resources and tools to classroom learning and teaching: executive summary December 1998 (<http://www.tact.fse.ulaval.ca/ang/html/rev98es.html>)

¹²Thérèse Laferrière, Benefits of Using Information and Communication Technologies (ICT) for Teaching and Learning in K-12/13 Classrooms (Ottawa: Industry Canada SchoolNet Program, 1999) 6.

In November 1994, *Byte* magazine published an article by Massachusetts physics and astronomy teacher S. Hughes Pack called "Teacher Training is Key." In the article, Pack explained the importance of teacher training to making computerized classrooms successful classrooms.

Teacher training is critical. If teachers can't use the technology, they won't. Too many school systems are following the corporate model of the 1980s, buying technology without the training, resulting in a great deal of frustration and an arsenal of underused equipment... Every dollar spent on technology should be matched dollar-for-dollar on training, yet few schools have made such a commitment.¹³

AMTEC's Ross Mutton agrees. He says there aren't enough training programs for teachers who want them, because of lack of money.

Government also makes a difference. While education policies throughout Canada have emphasized the need for computers in schools, few have addressed the need for teacher training. According to an October 1999 Statistics Canada survey, only about 30 per cent of students attend a school where it is mandatory for all teachers to take at least a basic computer training course. Furthermore, only 22 per cent of students attend a school where it's mandatory for all teachers to take courses on a regular basis to keep up-to-date with new technological skills.

"Every school is different, but teachers are all responsible for learning on their own," says Laurie Acorn, vice-principal of Brentwood Bay Elementary School in B.C.'s Saanich School District. At Brentwood elementary, lack of teacher training and experience in computers explains why school officials decided to place computers in a lab instead of classrooms.

"At first we started putting them in classrooms, but the teachers didn't know what to do with them," Acorn says.

¹³S. Hughes Pack, "Teacher Training is Key," *Byte* November 1994 (<http://www.byte.com/art/9411/sec15/art1.htm>)

It's not as though teacher training has been ignored completely. In Newfoundland and Labrador, for example, regional training centres deliver information technology to about 10 per cent of the province's teachers. The teachers are expected to take on lead-teacher roles in their schools and school districts. New Brunswick has a similar system. In fact, most provinces offer some type of training, even if it is limited to a small percentage of teachers.¹⁴

One way in which other teachers can build on their skills is through professional development day workshops. A number of professional development days are held in each province every year, giving teachers a day away from their classrooms to instead focus on developing their own skills. However, the vice-president of the Canadian School Boards Association Carole James says opportunities are still limited. Of the five development days in British Columbia, for example, teachers are only offered a choice about subject area on two. Technology is one of many areas teachers will be expected to choose from.

In Ontario, there are four training days per year -- down from nine a few years ago, says Nick Scarfo, an education officer in the curriculum assessment and policy branch of Ontario's Ministry of Education.¹⁵ The province also offers "summer institutes," at which teachers can receive training in a number of different areas, including technology, at no charge.

In-school training is also offered at some schools, but participation isn't mandatory.

"I've offered a lot, the district's offered a lot...." says teacher Paul Belland of the situation at Lillooet Secondary School. But sessions, he says, have been poorly attended.

Barbara Campbell, principal of Mutchmor Elementary School in Ottawa, says the

¹⁴Council of Ministers of Education, Canada. Developments in Information Technologies in Education December 1997 (<http://www.cmec.ca/reports/edtech-en.stm>) 16.

¹⁵Nick Scarfo, Ontario Ministry of Education, curriculum assessment and policy branch education officer, phone interview, 19 May 2000.

situation is similar at her school. Workshops are occasionally offered through the district before school hours, but only about one-third of teachers will attend.

Industry Canada's Doug Hull admits there are challenges to ensuring computers are used properly in schools.

"It does require a lot of extra work and extra resources, and largely unguided because there aren't a lot of people around who know the right methods," he says.¹⁶

Further, Hull says governments haven't invested much money on training.

"Not a lot of emphasis has been placed on educational training which is one of the reasons why teachers' federations, etc. react negatively to our great push on information technology," he says. "It's not that they're against it, they're not Luddites. They are trying to indicate that we may have our emphasis in the wrong place. We're putting more money on computers and Internet connectivity than determining how to use it better."

But according to Hull the government's strategy isn't necessarily a mistake. He maintains that the best way to spawn new and innovative ways of using the Internet is to expose teachers and students to the technology -- and let them come to their own conclusions. In the meantime, he says, training can be developed based on these strategies to eventually help other teachers develop their skills.

He says it's working, adding that just two or three years ago the Internet was barely used in schools. That's not the case anymore.

"It knocks the socks off business people when they really see what kids can do," Hull says.

Still, not investing money in teacher training seems to run counter to reports produced by government agencies -- including the Council of Ministers of Education, Canada (CMEC) -- as indicated by a 1997 report, called *Developments in Information*

¹⁶Doug Hull, interview, The Wired Classroom, Canadian Broadcasting Corporation, cbc.ca, April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

Technologies in Education.

“A common risk of planning for the integration of information technologies is that the focus inevitably falls first and foremost on the basics of hardware, software, and connectivity rather than on the development of teachers, so that they can apply new technologies to enhance learning,” the report reads. “Much remains to be done to provide teachers with the in-service programs they need to be comfortable with information technologies and be able to use them effectively as a tool in the teaching of the regular subjects in the curriculum.”¹⁷

The report also suggested that teachers have concerns about the impact of information technology and ways must be found to ease their anxiety.

“For students to realize the benefits of computer technologies, all teachers must be taught how to use computers and how to take full advantage of their pedagogical applications in the classroom,” the report reads. “Without proper training, information technologies are either ignored or can be a source of frustration to teachers.”¹⁸

Not everyone agrees teachers will be more likely to use computers in the classrooms even if they are adequately trained to do so.

Denis Semair, manager of educational technology for the Greater Victoria School District, says research suggests that just eight per cent of teachers who have received technological training actually apply it in the classroom.¹⁹

Furthermore, Semair says it’s difficult to make teachers do anything they’re uncomfortable with -- even if research indicates it may help students.

“I feel like I’m going around in a merry-go-round, because the (B.C. Teachers’ Federation) says there’s no way you can tell teachers to use technology or how to use it

¹⁷CMEC 31.

¹⁸CMEC 14.

¹⁹Denis Semair, Greater Victoria School District manager of education technology, phone interview, 19 May 2000.

because they have autonomy in their classrooms,” he says.

There is some evidence the emphasis placed on teacher training may grow -- at least in some jurisdictions.

In British Columbia, for example, the Ministry of Education will begin its second five-year technology plan this July. While the first plan emphasized infrastructure, hardware and software, this new plan will emphasize professional development for teachers, technical support, teacher support, and assistance in integrating technology into lessons, says educational technology branch manager Rick Withers.²⁰

The province has already announced an extra \$1.5 million in professional development funding related to technology for the 2000-2001 school year, says Withers, conceding the figure does seem small given the \$19 million the province spends annually on infrastructure. No extra money has yet been invested in technical or teacher support. Those areas are still being researched, Withers says, while the province is also currently developing an “Integration Support Tool Kit” which will help teachers integrate technology into their lessons.

“We’re gathering up all the best practices from teachers around the province and creating a vehicle to share all those practices,” Withers says. “It’s going a layer deeper than what has been done in the past.”

Yet Semair still sees problems in how technology is being set up in schools. Just as computers were thrown into classrooms with training following years later, he says the same is happening with the Internet. Just giving kids access to the Internet won’t work -- there needs to be a strategy in place as to how it can be used, and Semair says there isn’t one.

“We’re not even close,” he says. “We haven’t even started, except for a handful of

²⁰Rick Withers, educational technology branch manager, B.C. Ministry of Education, 23 May 2000.

teachers.”

Teaching philosophies of aging professionals

The inability of some teachers to use computers in the classroom, or their reluctance to do so, may in part be explained by teacher demographics. Canadian teachers, like employees in many traditional professions, are approaching retirement age en masse. The AMTEC report discussed the implication of having a middle-aged teaching staff whose employees weren't reared on computers.

Teachers perceive importance in terms of the things which were most a part of their world and the things which they are most comfortable with and around. Computers, for most teachers, are new and at least somewhat frightening. The language is foreign and, like learning any new language, requires the constant effort of translation in the mind.²¹

Such reasoning assumes that if teachers aren't familiar with technology, they won't be willing to incorporate it into classroom activities. By contrast, younger teachers, who have grown up using computers and information technology, may be more likely to use computers in classroom activities because they are already familiar with it.

Teachers are conservative, explains Lillooet's Paul Belland. Many teachers base their teaching philosophies on what they did in school, he says, adding that habit needs to change. Teachers need to recognize that they have to prepare students for the future, he says.

There are proportionately very few young teachers who have grown up on computers working in Canadian schools today. The Canadian Teachers' Federation estimates that more than 150,000 teachers will retire in the next decade, and expects a shortage of up to 20,000 qualified teachers as early as the 2001-02 school year.²² A report by the Council

²¹AMTEC 3.

²²Kathryn May, "Boomers' babies inundate schools" Ottawa Citizen 28 April 2000: A3.

of Ministers of Education in Canada suggests that because 45 per cent of teachers will retire or be near retirement by 2007, teaching with technology is a challenge.

"Many teacher do not embrace the new technologies, and are skeptical of their application in the classroom," the report reads. "The fact that there is an aging teacher cohort exacerbates the problem."²³

Although teacher training and the aging teaching staff could become less of an issue as older teachers retire, S. Hughes Pack cautions that high schools and colleges need to ensure computer literacy becomes a component of graduation requirements if computers are to be used effectively in schools.

"As younger people enter the teaching profession, the lack of computer-skilled teachers will gradually become less of an issue," Pack writes. "To this end, all high schools and colleges should have a computer-literacy graduation requirement. Conversely, schools should now require computer literacy of all serious job applicants. If our very significant investments in technology are to pay off, they must be coupled with equally significant investments in training teachers."²⁴

Yet Carole James, vice-president of the Canadian School Boards Association, says universities that offer teacher training haven't as of yet placed an emphasis on technology. The University of Victoria offered a summer course in 1999 for teacher-librarians on how to teach students how to critically analyze information they find on the Internet -- rather than just teaching them how to help students find what they need on the Internet -- but James says those types of course are rare.

"Teacher training in university is a key issue," she says. "There's an opportunity there. If universities take on technology training, then we won't need to do technology training."

²³CMEC 14.

²⁴Pack 3.

In 1999, the U.S. Department of Education announced a \$75-million program to prepare future teachers to teach with technologies. It would cost Canada about \$7.5 million to create a similar program.²⁵

Not all teachers, however, are convinced an aging teaching staff has impeded the use of computers in schools. Kennedy, for example, says he was written off as a Luddite in part because he's approaching retirement age.

"People have always thought I was down on computers. I wasn't," he says. "I was down on mindless computing."

Meanwhile, American critic and *Growing Up Digital* author Don Tapscott argues teaching traditions -- developed over time -- are a barrier to computer integration. While Tapscott says computers can help children learn and should be incorporated into classrooms, he is one of a number of experts in the field to suggest the traditional education system would have to be redesigned for computers to make a difference.

"Wiring the schools and populating them with computers is necessary but insufficient to ensure equal opportunity to share in the digital revolution," he says. "Children need access to computers and the Net, but they also need appropriate software and services. They need motivation to learn. They need a redesigned education system and teachers who have been retrained and reoriented."²⁶

American author William H. Dutton expresses a similar viewpoint in his book *Society on the Line: Information Politics in the Digital Age*. Film projectors, radios, televisions, VCRs, computers and the Internet haven't revolutionized learning and education in ways that proponents had forecast, he writes, but instead have each been adapted to play relatively marginal roles within the traditional system.

²⁵Laferrière, Benefits of Using Information and Communication Technologies 11.

²⁶Don Tapscott, Growing Up Digital: The Rise of the Net Generation (New York: McGraw-Hill, 1998) 262.

"Without a new paradigm," he writes, "educators are likely to use (information technology) to do things the way they have always been done, but with new and more expensive equipment."²⁷

Greater Victoria School District's Denis Semair agrees. He says computers will not work in the existing education system, which he says is an industrial model with an assembly-line approach, outdated curriculum and archaic time-tabled structure.

"To fit in a tool that allows flexibility and self-directedness, there's going to be a conflict there," he says.

According to Shelley Goldman, Karen Cole and Christina Syer of the Institute for Research on Learning in California, however, people need to recognize that content integration takes time. When teachers try to incorporate technology they aren't necessarily familiar with, they will experience glitches and what they perceive as flash over substance -- and they will often respond by backing off.

Even in schools where there is a strong push to adopt and use technologies, the road to content fulfillment is a long one. We see a pattern where the technology is front and center stage, rather than the academic content. In case after case we see that when computer technologies are adopted, the learning about the technology often takes over, and it is only after several rounds of integrating technology with content that content emerges in strong ways. The technology learning curve tends to eclipse content learning temporarily -- both kids and teachers seem to orient to technology until they become comfortable. This dilemma has important implications for teachers' willingness to adopt technology. This is because teachers in core subjects rightly see content, not technology, as the primary focus of their teaching efforts.²⁸

Teachers may also be frightened off by the new way they need to teach in a computerized classroom. As students work away on computers, teachers become guides rather than instructors. As American author and Berkeley professor Clifford Stoll explains in *Silicon*

²⁷William H. Dutton, Society on the Line: Information Politics in the Digital Age (Oxford: Oxford University Press, 1999) 214.

²⁸Goldman, Cole and Syer 1-2.

Snake Oil, the changing atmosphere can be disturbing.

"Try speaking to a group that has computers on their desks. First, you can't see everyone, because those monitors get in the way," he says. "The keyboards and screens compete for the students' attention. And you can't point to the screen so everyone can follow along. If someone's lost or can't find the control key, you must squeeze behind a row of students and point to the right place. Students in these classrooms have an easier time -- they can hide behind the monitors and avoid the teacher's gaze."²⁹

There are times, as Stoll's explanation suggests, when teachers who use computers teach technology as well as content. Other times, however, teachers will find themselves in a completely different position -- where their students actually know more about the teaching tool than they do.

"Large numbers of children see the computer as "theirs" -- as something that belongs to them, to their generation," says MIT's Seymour Papert. "Many have observed that they are more comfortable with them than their parents and teachers are."³⁰

COMPUTERS IN THE CLASSROOM: FOR BETTER OR WORSE

Though there are roadblocks preventing what some theorists would consider the optimum integration of computers into classrooms, it hasn't prevented researchers from studying the effects of computers on students. Some studies suggest computers can make a positive difference in student performance. Others studies discovered little difference between student performance in computerized classrooms and traditional classrooms. Still others dispute the first studies, while some claim computers can even have a negative effect.

²⁹Clifford Stoll, *Silicon Snake Oil: Second Thoughts on the Information Highway* (New York: Doubleday, 1995) 127.

³⁰Papert, *The Children's Machine* ix-x.

Words of encouragement

AMTEC's Ross Mutton says computerized classrooms can help students learn in both public and post-secondary institutions. There are two main benefits at the public school level, Mutton says. First, computers allow for an interactive process whereby students get immediate or close to immediate feedback. Second, the skills students learn while using computers are skills that can be used in the workforce.

"I can't think of a job out there that doesn't involve computers," Mutton says. "This type of technology will affect everybody, some more than others."

There is research to back up Mutton's opinion.

Ruth V. Small, an assistant professor at Syracuse University, notes that students like to learn things that will offer them benefits or real advantages. When students believe what they are learning is relevant, Small and Lankes argue, they will be more motivated and become more involved in the learning process. Small and Lankes discuss another strategy -- what they call the "flow" experience. Flow experiences occur when students become so captivated by the learning experience that they become immersed in it, to the point where they forget they are learning.¹¹

While MIT professor Nicholas Negroponte doesn't use that term in his book *being digital*, he does hint that computers can offer students a similar experience. Negroponte argues computers give teachers a new tool that will allow children to immerse themselves in an experience and learn as they would naturally -- through exploration and finding things out for themselves.

While a significant part of learning certainly comes from teaching -- but good

¹¹Ruth V. Small and R. David Lankes, "Motivating Students," University Teaching: A Guide for Graduate Students Eds. Leo M. Lambert, Stacey Lane Tice and Patricia H. Featherstrone (Syracuse, NY: Syracuse University Press, 1996) 96.

teaching and by good teachers -- a major measure comes from exploration, from reinventing the wheel and finding out for oneself. Until the computer, the technology for teaching was limited to audiovisual devices and distance learning by television, which simply amplified the activity of teachers and the passivity of children. The computer changed this balance radically. All of a sudden, learning by doing became the rule rather than the exception. Since computer simulation of just about anything is now possible, one need not learn about a frog by dissecting it. Instead, children can be asked to design frogs, to build an animal with frog-like behaviours, to modify that behaviour, to simulate the muscles, to play with the frog. By playing with information, especially abstract subjects, the material assumes more meaning.¹²

Negroponte supports this viewpoint with anecdotal evidence and test results which suggest "constructivist" approaches to learning -- in which children learn by doing -- are "extraordinarily rich means of learning, across a wide range of cognitive and behavioral styles."¹³

Don Tapscott, in his book *Growing Up Digital*, also argues that computers will help children learn. Child development, he writes, "includes the evolution of motor skills, language skills and social skills, as well as the development of cognition, intelligence, reasoning, personality, and the creation of autonomy, a sense of self and values ... all these are enhanced in an interactive world. When children control their media, rather than passively observe, they develop faster."¹⁴ He further argues that computers have restored to children what television took away.

The television robbed children of hours of play each day. The digital media is restoring this precious time. When asked why they like computers and the Net, their first response is "it's fun." However, while they're having fun -- playing -- they're also developing. Time spent on the Net is not passive time, it's active time. It's investigation time. It's skill development and problem-solving time. It's time analyzing, evaluating. It's composing your thoughts time.¹⁵

Countless studies have been conducted to assess the benefits of computer-assisted

¹²Nicholas Negroponte, *being digital* (Toronto: Random House, 1996) 199.

¹³Negroponte 200.

¹⁴Tapscott 7.

¹⁵Tapscott 8.

learning in schools.

The 1994 AMTEC report, which promoted the educational benefits of computerized classrooms for the Ontario Royal Commission on Learning, referred several times to the 1992 document "Educational Technology in New Jersey: A Plan for Action."⁴

The New Jersey action plan was designed to address signs that schools were not preparing young people for the workforce. It was launched in part as a response to a survey of eighth grade students, which suggested the average student spent 21.7 hours a week watching television, 5.6 hours a week on homework and 1.8 hours in outside study or reading. The action plan also cited federal reports which suggested: students score dismally on reading comprehension tests, students can't find South Africa on a map, only five per cent of Grade 12 students are proficient at problem solving, and only one in five high school seniors can write an adequate letter.

The New Jersey action plan concluded that while there is no instant solution to problems in schools, growing volumes of evidence show some of the most difficult problems in education can be resolved through educational technology.

"With the tools of technology," the report reads, "students can dramatically raise knowledge levels, learn problem-solving techniques, develop the skills required to manage massive amounts of information, analyze concepts from several different perspectives, and develop the hard-to-quantify higher-order analytic and critical thinking skills that are required in the global marketplace."

The report also cited research that suggests students who use technology are more motivated: attendance improves, behaviour improves and dropout rates decline. Furthermore, the report suggests, "over 20 years of research shows that when technology is used to enhance the instructional process, teacher productivity doubles and students

⁴Julia A. Stapleton, Educational Technology in New Jersey: A Plan for Action 1992 (<ftp://ftp.msstate.edu/pub/archives/nctp/new.jersey.txt>).

experience at least 30 per cent more learning in 40 per cent less time at 30 per cent less cost.”

Other studies support the report’s findings.

Between 1988 and 1991, the Center for Improved Engineering and Science Education (CESE) at Stevens Institute of Technology in Hoboken, New Jersey, conducted a study on learning in pre-algebra, algebra and geometry at five New Jersey high schools. The study measured the success of instruction with and without computer-mediated activities. Researchers found the group that studied with computer-mediated instruction showed a 45 per cent better performance on post-test over pre-test scores than students who didn’t receive instruction with the computer. The computer group also had 71 per cent better retention on delayed post-test over pretest scores. Lower-level students improved more than higher-level students.¹⁷

A literature review conducted for Vision: TEST (Technologically Enriched Schools of Tomorrow) in 1990 by the International Society for Technology in Education in Oregon reached the following conclusions:

- students improve problem-solving skills, outscore classmates, and learn more rapidly in a variety of subject areas when using technology as compared to conventional methods of study;
- students find computer-based instruction to be more motivating, less intimidating, and easier to persist with than traditional instruction;
- students’ self-esteem is increased with the use of computers, particularly when the students are at-risk or handicapped;
- using technology encourages co-operative learning, turn-taking, peer tutoring, and other valuable social skills; and, technology, when combined with properly trained

¹⁷Julia A Stapleton, Background on New Jersey’s Educational Technology Activities 1992 (<ftp://ftp.msstate.edu/pub/archives/nctp/new.jersey.txt>).

teachers, offers a dramatic solution to the dropout problem.³⁸

The Office of Educational Research and Improvement (OERI), part of the U.S. Department of Education, has found that "when used as part of an instructional approach involving students in complex, authentic tasks, technology can support the kind of transformation of student learning that is at the heart of education reform." OERI researchers concluded that:

- educational technology has had a significant positive effect on student achievement in all major subject areas:
- educational technology has had positive effects on student attitudes toward learning and on their self-concept:
- introducing technology into classrooms has been shown to make learning more student-centered, encouraging co-operation and stimulating teacher/student interaction; and,
- courses which used computer-based networks for communication between students and teachers, and students and other students, did not decrease traditional forms of communication."

Writing for OERI, Bernadette Caruso Davis and Daniel D. Shade concluded that just as "exploration of a concept encourages students to write letters, stories, poems, or reports, using a word processor allows children to compose, revise, add, and remove text without being distracted by the fine motor aspects and tedium of forming letters. Research demonstrates that children who write on word processors compose longer and more complex stories, are less worried about mistakes, and are more willing to revise."⁴⁰

³⁸Stapleton, Background.

³⁹Washington State Office of Superintendent of Public Instruction, Washington State Technology Plan for K-12 Common Schools 1994 (<http://inform.ospi.wednet.edu/edtech/app-de.html>).

⁴⁰Davis and Shade 2.

A 1998 study involving 1,184 Grade 9 students in 14 Alberta and B.C. high schools reported that students using a computer-based math program -- developed by education publisher ITP Nelson and the four Western provinces -- achieved higher test scores and higher levels of comprehension than students using textbooks in traditional classrooms.⁴¹

Studies have also suggested that teachers will benefit from using technology in their classrooms.

A review of research on school reform and technology, presented at the American Educational Research Association conference in Atlanta, Ga. by Barbara Means and Kerry Olson in 1993, contends technology:

- encourages teachers to present more complex assignments and material;
- encourages teachers to act as coaches rather than lecturers;
- creates a safe atmosphere for teachers to become learners again and share their ideas about teaching;
- can motivate students to try more difficult assignments and encourage them to take more care in presenting and revising their work; and,
- adds significance and value to school tasks.

Means and Olson concluded their review by noting that "technology is supporting kinds of activities that students might have done before, but it is making portions of them easier to accomplish and adding cultural value to the task by making it possible for students to produce products in the same way adults would to approximate real-world standards of quality."⁴²

Washington state education researchers Linda Roehrig Knapp and Allen D. Glenn cite a variety of research reports suggesting that teachers who teach with technology:

⁴¹Robert Sheppard. "March of the laptops: Is technology overtaking the classroom." Macleans 2 Nov. 1998.

⁴²Knapp and Glenn 14-15.

- expect more from their students;
- expect students to take more care in preparing their work;
- can present more complex material;
- believe students understand more difficult concepts;
- can meet the needs of individual students better;
- can be more student-centred in teaching;
- are more open to more than one perspective on problems;
- are more willing to experiment; and,
- feel more professional because, among other things, they spend more time helping students learn.⁴³

A 1991 study reviewed 59 studies on computer-assisted instruction and student outcomes and found, that:

- when incorporated as part of instruction, computer-assisted instruction leads to higher academic gains;
- the use of word processors leads to better writing than the use of paper and pencil;
- students learn faster with computer-assisted instruction than with conventional instruction;
- students are more likely to retain what they learn; and,
- lower-achieving students, younger students, and economically disadvantaged students tend to benefit more from computer-assisted instruction.⁴⁴

Online, on target

Studies have also been conducted on the benefits of online learning, and they are of particular significance to Canadian governments currently connecting all classrooms to

⁴³Knapp and Glenn 17-18.

⁴⁴Knapp and Glenn 26.

the Internet. A national study conducted by the U.S. Center for Applied Special Technology (CAST) found that students with online access do perform better than students without online access. The study isolated the impact of online use and measured its effect on student learning in the classroom.⁴⁵

The CAST study compared the work of 500 students in fourth-grade and sixth-grade classes in seven urban school districts (Chicago, Dayton, Detroit, Memphis, Miami, Oakland and Washington DC) -- half with online access and half without. Both online and control groups carried out a common unit of study on civil rights, a familiar interdisciplinary topic for schools. All classes were encouraged to use technology-based resources, including multimedia reference materials and video tapes for their projects, but only the experimental group was allowed to use online resources, activities and communication. Student learning was measured by evaluating students' final project, based on nine learning measures: effectiveness of presentation, effectiveness of stating a civil rights issue, accuracy of information in relation to selected issue, presentation of a full picture, demonstration of insight into civil rights, effectiveness of bringing together different points of view, completeness, organization, demonstration of "best work."

The findings? Students with access to the Internet produced better projects than students without online access. They received higher scores in all nine learning measures, while the higher scores were statistically significant for five of the nine measures. Researchers also found that "students who used online access became more confident and students without online access become less confident, over the course of the study, in carrying out and presenting a research project."⁴⁶

It is also significant to note, however, that unrelated competencies -- including basic

⁴⁵CAST, "The Role of Online Communications in Schools: A National Study" 1996 (<http://www.cast.org/publications/stsstudy/>).

⁴⁶CAST 5.

skills in reading, writing, arithmetic -- did not show similar boosts in confidence.

Once students with online access had completed their projects, they reported an increase in how often they used the computers for types of project-based assignments for which online use is suited. In contrast, there was a decrease in the control group's reports of using computers for the same activities. Researchers concluded the Internet can help students become independent critical thinkers, able to find, organize and evaluate information, and effectively express their new knowledge and ideas in a compelling way.

Teachers who took part in the study with online groups reported that their students "found information more quickly, drew resources from a larger number of sources in a wider variety of formats, and dealt with information in ways that made the material more relevant to their lives." Teachers also reported that e-mail and message boards helped their students learn from other students, teachers and the community at large.

"The direction of change for the experimental teachers was toward using technology in the way that literate adults use computers -- to enhance performance directly in gathering, organizing, and presenting information," the researchers concluded. "The direction of change for control teachers was from an educational standpoint, more traditional. They increased the use of computers as teaching devices -- using them to teach basic skills, or merely to reward other kinds of skill development."⁴⁷

A word of caution

Some researchers, however, argue that studies which extol the benefits of computers in the classroom are misleading. These studies, they argue, focus on technology at the expense of all the other factors that contribute to a positive learning environment, including the teacher.

⁴⁷CAST 6.

In 1993, the U.S. Office of Educational Research and Improvement (OERI) completed an analysis of studies which had compared delivery of content through computers with delivery of content through other media such as radio, textbook or lecture. Analysts discovered that “most of this literature finds newer technologies to be either equivalent or superior to conventional instruction with regard to student learning.”⁴⁸

However, the analysis further reported a 1985 study which had examined previous studies for an analysis of computer-aided instruction. The 1985 study found that many previous studies had not controlled for instructional methodology. A re-analysis of the studies which held that factor constant found virtually no effect related to instructional delivery media.

The OERI also cited a 1991 research study that likened isolating the media through which material is delivered to asking “how much did the flute, in a 120-piece orchestra, contribute to the quality of the music?” The OERI has attempted to address these shortcomings by encouraging “contextualized” research, that looks at how the use of technology within a classroom contributes to the whole effect, and how different factors interact to help children learn.⁴⁹

The report cited a 1989 study of fourth graders using telecommunications as an example of contextualized research. In this study, four classes in San Diego participated in an on-line telecommunications project with students from Hawaii, Mexico and Alaska in which they contributed news to the “newswire” and produced a collaborative newspaper. As a result of the project, the reading and writing skills of the four San Diego classes jumped over one grade level.

OERI further reports, “Those students who served as volunteer editors showed striking gains in language mechanics.” The conclusion of the study was “the experience of editing

⁴⁸Washington State Office of Superintendent of Public Instruction 1.

⁴⁹Washington State Office of Superintendent of Public Instruction 3.

others' writing produces more improvement than practice correcting one's own mistakes and that students are reluctant to edit the work of their classmates but much freer to criticize and correct the work of a distant peer."

Words of warning

Jane M. Healy is an educational psychologist and adjunct professor at Cleveland University with more than 35 years of professional experience. During those 35 years, she's worked as a classroom teacher, college professor, reading and learning specialist, and elementary school administrator. She has also written four books about children and how they learn, including her latest, *Failure to Connect: How Computers Affect Our Children's Minds -- for Better and Worse*. In researching her last book, published in 1998, Healy spent hundreds of hours in classrooms, labs, and homes watching kids use technology. What she saw surprised her.

"As a longtime enthusiast for and user of educational computing, I found this journey sometimes shocking, often disheartening, and occasionally inspiring," she says. "While some very exciting and potentially valuable things are happening between children and computers, we are currently spending far too much money with too little thought. It is past time to pause, reflect, and ask some probing questions."⁵⁰

The questions Healy focused on in *Failure to Connect* included technology use in light of brain development, stages and styles of learning, emotional-social development, and successful educational practice in school and at home.

According to Healy, the way children use computers may have "powerful long-term effects on their minds." The reason, she explains, is because using any medium affects the underlying neural circuitry that is being established during childhood and

⁵⁰Jane M. Healy, *Failure to Connect: How Computers Affect Our Children's Minds -- For Better or Worse* (New York: Simon & Schuster, 1998) 18.

adolescence.⁵¹ The brain, she says, grows as it responds actively to its environment and becomes custom-tailored to that development. Accordingly, Healy is particularly concerned with the effects an education system which relies heavily on computers may have on elementary school students.

As there have been no studies on the direct links between computer use and children's brain activity, most of Healy's arguments are based on research into the way children learn. Healy gives several examples of potential conflicts between the way children learn and the way computers encourage students to learn. For example, she argues that the brain moves from concrete learning (touching, feeling, tasting, manipulating, physically exploring and building) through symbolic representations (letters, pictures, words, stories, math problems and mental images) to more abstract thinking (hypothesis testing, metaphors and understanding and applying formal rules of grammar or calculus). Computer use, being primarily two-dimensional, may not be developmentally appropriate before age seven or eight when children are still in the phase of concrete learning.⁵²

Furthermore, Healy says, the brain uses many systems which interconnect with practice. An important aspect of the brain's development is the process of integrating the workings of different parts of the brain. This integration, she explains, comes from time-consuming practice as learners transform raw materials, like clay, into new forms like clay figures.

"Having a computer do too much integrating (e.g.: combining picture, sound, movement), so the child simply experiences rather than coordinates it all himself, eliminates an active process that may prove to be irreplaceable," Healy writes, adding such activities could undermine the connection of left and right hemispheres of the

⁵¹Healy 131.

⁵²Healy 134.

brain.”⁴³

Between age seven and nine, children are also developing what Healy calls “response organization.” Response organization can also be hindered by computer programs.

“As the brain learns to control where it focuses, it must then learn to do something about it -- form a plan and act on it in an organized, efficient manner. Many children’s software programs -- even nominally educational ones -- take responsibility for selective attention and response organization away from the child by running the show themselves.”⁴⁴

Healy concludes computer technology is risky as an educational tool with children aged four to seven, because at this age children should be pushed to develop an internal mental life, to imagine, wonder and practice managing behaviour.⁴⁵ Children should be playing with each other, because it is the young brain’s primary means of intellectual development and creative expression.⁴⁶

“If the computer can accomplish the task better than other materials or experiences, we will use it. If it doesn’t clearly do the job better, we will save money and use methods that have already proven their worth. In the case of the child under seven, there are a few things that can be done better on a computer and many that fail miserably by comparison.”⁴⁷

Young children, Healy says, also learn better by working things through in a physical way.

“Learning the muscular and tactile feel of forming spelling patterns in words or writing out equations in math help children remember them.” she explains, adding that

⁴³Healy 136.

⁴⁴Healy 183.

⁴⁵Healy 179.

⁴⁶Healy 223.

⁴⁷Healy 218.

reading an answer off a calculator doesn't fix learning in the brain.⁵⁸

Between ages nine and 12, children refine the skills they learned from age four onward. Unless used in an "exemplary fashion," socially isolating technology like computers can distort this process, Healy says. Children at this age need caring relationships with responsive adults, and computers can not be a substitute. Once children reach their mid-teens, she says, computers have a lot to offer, because by this time youth have reached a stage of "neural maturation" that makes them better equipped to handle new technologies.⁵⁹

According to Healy, however, computers should be integrated cautiously into schools at any age.

"Electronic landscapes reduce reality in many ways," she writes. "Fewer than 10 per cent of children in the U.S. now learn about nature from the outdoors, about one-third from school, and more than half learn about it from some sort of electronic device (e.g.: television, nature shows, CD-ROMs). Yet, remarks Clifford Stoll, no computer can teach what a walk through a pine forest feels like. Sensation has no substitute."⁶⁰

Stoll, an astronomy professor at Berkeley professor and author of *Silicon Snake Oil* and *High Tech Heretic*, is indeed quick to criticize the emphasis computers place on virtual experiences. In *Silicon Snake Oil*, he describes an astronomy class in which students no longer had to go up on a roof and observe and chart stars. Instead:

today's class provides students with a floppy disk of software to show them how to pick stars and rotate coordinates. The pupils see pretty star charts on their screens along with a list of positions. Enter the right command, and the program measures angles. They never have to go outside. I won't say anything about teaching astronomy without looking at the sky. However, I'm damned worried that these students spend most of their time learning tools, rather than concepts. Science is knowing about our environment, not being able to manipulate a

⁵⁸Healy 287-88.

⁵⁹Healy 179.

⁶⁰Healy 225.

computer program.⁶¹

In *Failure to Connect*, Healy also cites many studies that have investigated links between computer-assisted learning and children's grades. Some studies, she says, find some computerized instruction raised achievement scores, while other studies find computer-assisted learning significantly lowered scores.⁶² Other studies found little change either way. University of Michigan researcher James Kuluk, for example, compared computer-assisted learning with the same amount of time spent with pencils, papers and printed materials -- and found the traditional materials did as well or better. Furthermore, students tutored by fellow classmate scored almost as well as those tutored by computers. These findings led Healy to conclude researchers could expect skilled teachers to produce even better results.⁶³

There is also concern that computers won't teach children the correct problem-solving skills. "I am discouraged by my estimate of what they are learning, namely: Don't stop to think, don't work the problem through, don't read the few text screens (even if they could), just jump in and try something -- if it doesn't work you can blow it up, start again, or switch programs," Healy writes.⁶⁴

Most of the studies that discuss drawbacks of computer-assisted learning, however, do so by debunking positive results published in other studies. For example:

- A 1992 analysis of 30 studies on computer-based learning systems in the elementary and middle grades, published in the *Journal of Educational Computing Research*, found little conclusive evidence of positive impact. It concluded most studies that claimed benefits had used poor evaluation designs and inadequate data collection and

⁶¹Stoll 123.

⁶²Healy 63.

⁶³Healy 63.

⁶⁴Healy 46.

analysis.”⁵

- In his article “The Benefits of Information Technology,” U.S. researcher John Kosakowski outlines three reasons why traditional methods of evaluating the effectiveness of educational technology are problematic. Firstly, he found that most tests don’t reliably measure the outcomes being sought. New measures, he explains, need to be developed to assess higher-level skills and other effects of technology. Secondly, assessments don’t really measure technology -- they measure the teaching processes enabled by technology. The outcomes of the tests, therefore, are dependent on how technology is implemented into the entire teaching process. Instructional design, content and teaching strategies -- with both the technology and the classroom environment -- will affect the outcomes. Finally, the changing nature of technology makes meaningful evaluation difficult because the technology being evaluated is often out of date by the time long-term studies have been completed.”⁶

Berkeley’s Clifford Stoll argues that computer-based projects are often over-rated solely because they make use of technology. He gives as an example an experiment among fifth-grade students in Washington state. As a geography project, the students used computer networks to find out how much 12-inch pizzas would cost in the American states. They found a high of \$12 in Alaska and a low of \$4 in Ohio. The students learned about geography and economics while also learning how to use the Internet. But, as Stoll says, the data could just as easily have been retrieved by the phone or fax machine.

“There’s nothing inherent in the Internet here -- it’s just the data transmission vehicle,” he writes. “More damaging: they were learning the wrong-most thing about

⁵Henry Jay Becker, “Computer-based integrated learning systems in the elementary and middle grades: A critical review and synthesis of evaluation reports,” Journal of Educational Computing Research Vol 8, No. 1, 1992: 1-41.

⁶John Kosakowski, “The Benefits of Information Technology,” Eric Digest 1998 (http://www.ed.gov/databases/ERIC_Digests/ed420302.html)

geography -- that data collection is an end in itself. It's usually the easy part of research, and the part requiring the least thought. Better to hear how the fifth-graders worked with the data further, coming up with hypotheses, explaining the trends in pizza prices."⁷

Facts and figures aren't the only things students acquire in school. It's the "by-the-way" learning that might disappear in computerized classrooms that has University of Toronto professor emeritus Ursula M. Franklin worried.

Whenever a group of people is learning something together, two separate facets of the process should be distinguished: the explicit learning of, say, how to multiply and divide or to conjugate French verbs, and the implicit learning, the social teaching, for which the activity of learning together provides the setting. It is here that students acquire social understanding and coping skills, ranging from listening, tolerance, and co-operation to patience, trust, or anger management. In a traditional setting, most implicit learning occurred "by the way" as groups worked together. The achievement of implicit learning is usually taken for granted once the explicit task has been accomplished. When external devices are used to diminish the need for the drill of explicit learning, the occasion for implicit learning may also diminish."⁸

Theorists like Franklin argue that students acquire more than facts and figures at school. Children learn about socializing, sharing, listening, tolerance and understanding as well.

Even Microsoft founder Bill Gates acknowledges concerns like those raised by Franklin. But he argues that computers will stimulate all types of learning -- and argues there's room for both computer-assisted learning and traditional learning.

"Learning with a computer will be a springboard for learning away from the computer," he writes in *The Road Ahead*. "Young children will still need to touch toys and tools with their hands. Seeing chemical reactions on a computer screen can be a good supplement to hands-on work in a chemistry lab, but it can't replace the real experience. Children need personal interaction with each other, and with adults, to learn social and

⁷Stoll 129-130.

⁸Ursula M. Franklin, The Real World of Technology (Toronto: Anansi Press, 1999) 170.

interpersonal skills, such as how to work co-operatively.”⁶⁰

But just as there is no easy answer to the question of whether computer-assisted learning will really boost students' performance, there is also no clear answer as to what effect a heavy emphasis on computer-assisted instruction may have on the “by-the-way” learning going on at schools.

COMPUTERS AND THEIR SOCIAL CONSEQUENCES

Grades aside, there are other issues researchers and theorists like Franklin look at when discussing the pros and cons of computer-enhanced education. Such writers consider the by-the-way consequences of computerized schools to be as significant as the impact computers may have on grades. Most frequently cited social consequences include greater equity for all students, the possible tendency of computers to isolate students and the long-term effects computers may have on skills like reading and writing.

Equality of opportunity

About 42 per cent of Canadians have a computer in their home, while about 20 per cent of Canadians have Internet access at home, according to an Angus Reid Group survey released in March 2000. One of the goals behind the federal government's Connecting Canadians and SchoolNet programs, as well as provincial programs designed to connect classrooms to the Internet, is to ensure all Canadians have equal access to the computer technology which is expected to drive the “Information Age” economy.

U.S. psychology professors like Chuck Huff, with St. Olaf College, and Thomas Finholt, with the University of Michigan, argue that computers and their applications are still costly enough that school-based computers are needed to give children equal

⁶⁰Bill Gates, The Road Ahead (New York, Penguin Books, 1995) 198.

opportunities regardless of their parents' income.

"While the cost of computers will continue to drop, the cost of new applications and the associated training will be sufficiently high that not everyone will be able to afford it," they write in their 1994 book *Social Issues in Computing: Putting Computing in its Place*. "In fact it is quite likely that large, lower-income sectors of the society will not have opportunities to experience cutting-edge computing technology unless they find it at school."¹⁰

Not everyone agrees. Don Tapscott, author of *Growing Up Digital*, says equity theories don't make sense. He argues an emphasis on computers in schools may widen the gap.

Our research shows that the digital divide is actually widening, not disappearing. As the new technology trickles into poorer neighbourhoods and schools, the better off children are leapfrogging others -- getting not only better access, but a wider range of services, faster access, the best technology, and, most importantly, increasing motivation skills and knowledge. This not only exacerbates the fluency gap but also the gap in different economic classes' capacity to learn and have successful lives. Have-nots become know-nots and do-nots.¹¹

Students have also noticed the difference, at least according to Roger Lauzon, a Grade 12 student at Lillooet secondary school. Lauzon analyzed students' computer use for a class project, and prepared the report on his home computer -- something he says most of his classmates at the time didn't have.

"I got a better mark than people who did a lot more work than me because I did it on the computer," he says. "It looked a lot more professional."

Lauzon's observation may point to what MIT's Seymour Papert predicts will create a new type of division between students -- between children who have a computer at home and those who use them only in schools and have less time to experiment with the

¹⁰Chuck Huff and Thomas Finholt, *Social Issues in Computing: Putting Computing in its Place* (New York: McGraw-Hill Inc. 1994) 381.

¹¹Tapscott 11.

technology.⁷² A 1985 study of students aged eight to 13 in California public schools with a required computer curriculum backs up this viewpoint. The study showed children understand computers best if they learn about them outside of school.

Yet there are ways in which computers will give students access to experiences that may otherwise have been unavailable to them. Some students are already enjoying the benefits.

Wired classrooms, for example, can allow students throughout the country to see what they might not be able to see otherwise. Elementary school students in the Okanagan town of Lumby, B.C. were able to tour the Royal British Columbia Museum in Victoria in November and December 1998 -- courtesy of an electronic virtual field trip.

Two student hosts and a teacher from J.W. Inglis Elementary School toured the visiting Leonardo da Vinci exhibit with radio-remote video cameras that linked the tour back to their classmates through the Internet. Students watching over the Internet in Lumby could ask questions and direct the cameras to areas of interest. It wasn't the same as being there in person, but it gave students a chance to see something that may not have been able to otherwise.

"Technology has removed the barrier of geography," then B.C. education minister Paul Ramsey said.

Do computers encourage isolation?

On Sept. 8, 1999, a column by Norman Doidge in the *National Post* carried the headline "Why geek geniuses lack social grace." Doidge pondered why a school like the Massachusetts Institute of Technology -- one of the most highly-regarded post-graduate

⁷²Cynthia Solomon, Computer Environments for children: A Reflection on Themes of Learning and Education (Cambridge: The Massachusetts Institute of Technology, 1986) 135-136.

school for mathematics and computers in the world -- had to offer a course that MIT students have dubbed "charm school."

The course, Doidge wrote, is designed to teach entering students the most basic social skills, often at a rudimentary level. The answer to his query, he suggested, could be found in the 1997 book *Shadow Syndromes: The Mild Forms of Major Mental Disorders That Sabotage Us*. The book was written by Harvard psychiatrist John J. Ratey and Dr. Catherine Johnson, an editor and trustee of the National Alliance for Autism Research.

In *Shadow Syndromes*, Ratey and Johnson look at a number of psychological disorders -- from depression to attention deficit disorder to autism -- and then investigate the existence of milder forms of the disorders, or what they call shadow syndromes. Their research led Ratey and Johnson to link mild forms of autism to computer proficiency.

Social stereotyping aside, the most recognized embodiment of this shadow syndrome is the nerd. He is the computer programmer hunched over his monitor at all hours of the day and night, a pocket protector lodged permanently in his rumpled shirt. He has few or no friends; often he has no wife. He is a geek. He is called "geek" or "nerd" or "wonk" for one reason alone: he is socially awkward. Out of it.⁷³

Ratey and Johnson define autism, full-blown and mild, as a "primary deficit in the ability to form and sustain relationships with other people no matter who they are."⁷⁴ A person with such a social disability, they argue, will be at a terrible disadvantage in dealing with the world. Although few people would likely call the world's richest man, Microsoft founder Bill Gates, disadvantaged, Ratey and Johnson say Gates may suffer from a mild form of autism, a connection they were not the first to notice. As Ratey and Johnson explain, *Time* magazine once ran an item comparing Gates to the famous autistic savant Temple Grandin, adding that Gates's reported autistic qualities include "rocking, jumping on trampolines, not making eye contact, and not having the social skills necessary to

⁷³John J. Ratey and Catherine Johnson, *Shadow Syndromes: The Mild Forms of Major Mental Disorders that Sabotage Us* (New York: Bantam Books, 1998) 218.

⁷⁴Ratey and Johnson 215.

enter a group conversation.”⁷⁵

Ratey and Johnson have few theories to offer as to why mildly autistic people are drawn to computers, and usually good at using them. It could be that because people with any degree of autism are oversensitive to stimuli and don't tolerate change, the controlled environment of computer programming may appeal to them. Or, perhaps, it's because autistic people generally have strong visual-spatial skills, and are good at seeing how things (like the codes of a computer program) fit together.

On the social level, however, Ratey and Johnson argue that even children with mild autism will likely flounder. Autistic children, for example, will have trouble understanding why they should play games. They won't understand the concept of sharing. They won't pick up social skills. They'll often be teased, because they'll find it difficult to make friends. Computers, then, may appeal to mildly autistic children as an alternative to direct contact with people.

The one question Ratey and Johnson don't answer -- or even ask -- is whether children with a mild form of autism would benefit and flourish within a computer-assisted educational environment, or whether computers would encourage them to withdraw even more socially. Further, they don't say whether these children would benefit from a scaled-down version of MIT's charm school, or whether teachers should place more emphasis on learning environments that encourage social interaction.

It is the social consequences of computers, such as their isolating tendencies, that many researchers are turning to when debating the merits of computers in the classroom. In *“Should Computer Dependency be Considered a Serious Problem?”*, author Margaret A. Shotton of the University of Nottingham argues that childhood feelings of hopelessness “will probably be perpetuated” as computers become more prevalent.

⁷⁵Ratey and Johnson 219.

Shotton, who also wrote the 1989 book *Computer Addiction?*, also discusses the possibility that certain people could become addicted to their interaction with the computer. Shotton says the concern is especially important in relation to children, where the computer could in fact be a source of danger and subversion.

"Parents become concerned when their children appear to cut themselves off from social activities in order to play with the computer for hours at a time," she writes.⁶⁶

Shotton's viewpoint is supported by MIT researcher Sherry Turkle, who in 1984 wrote that "we are all perhaps looking for an idealized person with whom to share our lives, and some find it in a relationship with a computer."⁶⁷

Educational psychologist Jane M. Healy expands on the dangers of technology that may isolate young children.

Technology should never be allowed to separate a child from his own self as expressed in talk. Most software or "surfing" precludes discussion, reading, or even talk beyond single words ("There," "Oops," "Yes!!"). This is a poor recipe for a well-developed brain. More extended reading and conversation, on the other hand, will encourage youngsters to articulate and mediate problems with words. If this important groundwork is neglected or subordinated to electronic babble, it will never be regained.⁶⁸

Studies do suggest that computers, by their very nature, may discourage group work on a large scale. For example, Kathleen Wilson and William Tally of the U.S.-based Center for Children and Technology studied the use of computers in a classroom in which a teacher encouraged several children to collaborate with one another on the creation of a group report.

Their findings? In the end, group work that involved more than two students was not

⁶⁶Margaret A. Shotton, "Should Computer Dependency be Considered a Serious Problem?" *Social Issues in Computing: Putting Computing in its Place* Eds. Chuck Huff and Thomas Finholt (New York: McGraw-Hill Inc., 1994) 677.

⁶⁷Shotton 680.

⁶⁸Healy 191.

successful. Likely factors included the fact that computers were set up in a way which made it difficult for more than two students to sit directly in front of the machine, computer software which was open-ended but allowed only a couple of students to have meaningful input at one time, assignments that required a degree of concentration difficult to achieve with more than two students, and the personalities of the students. Students working in larger groups were more likely to be distracted from the assignment, and instead start browsing, playing with games or fighting for control of the computer.”

Other researchers, however, don’t give any merit to isolation theories.

“I wish I had a dollar for every time I’ve heard that computers are isolating our children,” Don Tapscott writes in *Growing up Digital*. “What’s the truth? The kids we worked with don’t think the computer isolates them but rather the opposite... The reason they feel that way is that the Net is a communications medium. Unbeknownst to the critics, the computer has changed from a tool for information management to a communication tool... Digital kids are learning precisely the social skills which will be required for effective interaction in the digital economy. They are learning about peer relationships, about teamwork, about being critical, about how to have fun online, about friendships across geographies, about standing up for what they think, and about how to effectively communicate their ideas.”⁸⁰

A 1990 pilot project by the Educational Technology Centre of B.C., the University of B.C. and 12 schools found that computers had a positive impact not only on students’ learning but on their social and emotional growth.⁸¹

Tapscott says the Internet is the first communication technology to give youth a voice. Until the Internet, he says, communication through the media was something, in large

⁸⁰Wilson and Tally 7.

⁸¹Tapscott 106-7.

⁸²AMTEC 5.

part, done to youth not by youth.

“This new media provides a platform for millions of youth to argue, worldwide and in real-time, on chat lines or at different times through online forums or bulletin boards,” he writes.³²

In addition, due to the fact anyone can post anything on the web provided they have access to a computer and adequate knowledge, youth have been able to publish their own electronic magazines.

“The introduction of youth zines to the Internet is a quantum leap forward in the democratization of the media for kids,” Tapscott writes. “There have always been some media that looked at the world through youthful eyes, such as campus newspapers and student radio, but in the overall media scheme these were insignificant. Their audiences were minuscule and the people who worked on the papers and radio stations were young adults, not adolescents.”³³

Many education theorists would likely support Tapscott’s viewpoint. For example Renee Hobbs, director of the Media Literacy Project at Clark University in Massachusetts, says “the power of technology is unleashed when students can use it in their own hands as authors of their own work and use it for critical inquiry, self-reflection and creative expression.”³⁴

Given that one of the unique aspects of the Internet as a medium of communication is the fact that it is participatory and interactive, giving youth equal status in the virtual public sphere, one could argue that schools must provide students with a chance to find their own online voice. As Jon Katz wrote in *Wired* magazine in July 1996: “Children have a right to two-way communications with the politicians, clergy, and educational

³²Tapscott 88.

³³Tapscott 84.

³⁴Hobbs 20.

leaders who claim to know what is best for them. Children have a right to help shape discussions about their moral lives.”⁸⁵

Spoken words, written words, computerized words

In his book *The Gutenberg Elegies*, award-winning U.S. critic Sven Birkerts bemoans the displacement of the page by the screen, and the millennial transformation of society. It's a trend, he argues, that started with the advent of television. A university English professor, Birkerts has talked to his students, who were reared in the 1970s, about their relationship to reading.

What emerged was this: that they were not, with few exceptions, readers -- never had been: that they had always occupied themselves with music, TV and videos; that they had difficulty slowing down enough to concentrate on prose of any density; that they had problems with what they thought of as archaic diction, with allusions, with vocabulary that seemed “pretentious”: that they were especially uncomfortable with indirect or interior passages; indeed with any deviations from straight plot; and that they were put off by ironic tone because it flaunted superiority and made them feel that they were missing something. This list is partial. All this confirmed my long standing suspicion that, having grown up in an electronic culture, my students would naturally exhibit certain aptitudes and lack others. But the implications, I began to realize, were rather staggering, especially if one thinks of this not as a temporary generational disability, but rather as a permanent turn.”⁸⁶

Unlike Don Tapscott, who argued in *Growing Up Digital* that computers will reverse the trend of passivity inspired by television, Birkerts argues computers will exacerbate the trend -- and society will soon include a generation cut off from history as seen through literature and textbooks.

“Next to the new technologies, the scheme of things represented by print and the snail-paced linearity of the reading act looks stodgy and dull,” Birkerts writes. “Many

⁸⁵Jon Katz, “Kids Cyber Rights,” *Wired*, July 1996 166.

⁸⁶Sven Birkerts, *The Gutenberg Elegies: The Fate of Reading in an Electronic Age* (New York: Ballantine Books, 1994) 19-20.

educators say that our students are less and less able to read, or analyze, or write with clarity and purpose. Who can blame the students? Everything they meet with in the world gives them the signal: That was then, and electronic communications are now."⁸⁷

Does it matter? According to some theorists, No.

Don Tapscott, for example, argues that computer use, particularly the Internet, encourages active, critical thinking.

On the Net, children must search for, rather than simply look at, information. This forces them to develop thinking and investigative skills, and much more. They must become critics. Which Web sites are good? How can I tell what is real and what is fictitious -- whether it's a data source or the alleged teenage movie star in a chat session. Further, children begin to question assumptions previously unchallenged. On the Net, there is a great diversity of opinion regarding all things and constant opportunities to present your views. This is leading to a generation which increasingly questions the implicit values contained in information. Information becomes knowledge through the application of human judgment."⁸⁸

Tapscott also disagrees with people like Birkerts, who argue television and now computers will lead to a decreased attention span in youth. When children use the Net, they will learn how to ignore inappropriate sources of information and concentrate on information that is useful. Students also learn how to plan ahead, determining what information they need to locate and how to get there.

"Rather than killing attention," Tapscott argues, "it makes more sense to view experience with multiple information sources, as it occurs on the Net, as helpful in developing this capability."⁸⁹

MIT's Seymour Papert, meanwhile, argues that some critics are rejecting what he calls the third stage in the way information is transmitted in society. Society has entered the era of computer-based communication, he argues, following ages of oral communication

⁸⁷Birkerts 119.

⁸⁸Tapscott 26.

⁸⁹Tapscott 109.

and written communication.

MIT's Nicholas Negroponte, in *being digital*, says the new era of computer-based communication removes the limitations of the printed page. Take hypermedia -- the Internet device that allows browsers to click on an underlined Web site address or picture and instantly be transported to the new site from the site they'd originally visited. Negroponte compares hypermedia to an advent calendar, or a collection of elastic messages that can stretch and shrink with the reader's actions. Hypermedia, he says, more closely resembles typical ways of communication and thinking -- where people may change from one topic to another, or expand on one area of a subject before continuing on with a story. It encourages, rather than hinders, action on the part of the reader.⁹⁰

Not everyone agrees.

In his book *Hypertext and Cognition*, Jean-Francois Rouet claims that in most studies hypertext has come in as a poor second to traditional text. Reading from a screen, he suggests, is slower, more tiring and less accurate. In addition, people are more likely to reach a stage of "information overload" than they would be through standard reading.⁹¹

Educational psychologist Jane M. Healy concurs with Rouet. She agrees hypermedia is a revolutionary way of presenting information because it doesn't follow the sequential order of traditional text. But she's not convinced it's a positive revolution.

"Since the brain's wiring tends to make looking easier than listening, a major issue with hypermedia is whether the pictures distract students too much from reading the words," she writes. "Another question is whether the random nature of these bits of information will accurately convey what needs to be learned. Will students be better informed -- or will they be distracted."⁹²

⁹⁰Negroponte 70.

⁹¹Healy 152.

⁹²Healy 147.

AMTEC's Ross Mutton, meanwhile, may be overwhelmed by the information revolution going on around him, but he remains optimistic about the direction in which the revolution appears headed -- provided that educators are aware of how and why computers should be used in schools.

"The worse thing that could happen is to have the technology -- and have it fail because we didn't use it properly, because people weren't trained," he says.

CHAPTER FOUR

Trade-offs: Is technology a wise investment?

Justin Millette is one of about 1,300 students who attends South Carleton High School in Richmond, just west of Ottawa. But the 20-year-old OAC student knows as much about school policies as just about anyone else at his school.

Elected student council president at South Carleton last June, Millette automatically became involved in the regional Student Presidents' Council. From there, he was elected a student trustee for the Ottawa-Carleton District School Board.

As one of three student trustees, Millette is required to attend board meetings twice a month, and specific committee meetings each week.

"I try to make as many as I can," he says.¹

That includes budget meetings which this year, as in past years, have been long and emotional. The Ottawa-Carleton District School Board's budget has been cut to \$510 million in 2000-2001 -- down \$18 million from the previous year, and \$30 million from 1997-98.² The budget is expected to shrink to \$471 million by 2002-2003.³

As a result, programs have been cut significantly -- from English-as-a-Second Language (ESL), to special needs education, to counselling. Some schools are overcrowded; others are being considered for closure because they aren't full and school districts could use the money better elsewhere. Parents, if budget meetings are any indication, are angry.

The Ontario government may not have a lot of money to invest in education -- or any area -- right now. But Millette argues it could do a better job if it knew what students

¹Justin Millette, South Carleton High School student, phone interview, 20 April 2000.

²"ESL training faces money crunch." Ottawa Citizen Online 12 April 2000 (<http://www.ottawacitizen.com/editorials/000412/3916510.html>).

³Kate Jaimet, "Special education, ESL fight for funding." Ottawa Citizen Online 21 March 2000 (<http://www.ottawacitizen.com/city/000321/3792350.html>).

really needed.

"They all sit in offices in Toronto and they don't see the actual day-to-day school day of some of these students," Millette says.

Millette also questions the decisions the government makes about where to invest the money it does have. For example, although he says computer education is "a good thing," he wonders if the thousands of dollars spent wiring South Carleton's old classrooms to the Internet during the first three months of 2000 couldn't have been better spent elsewhere.

"Our walls are falling down, but we'll have computers into the next century," he says. "It's kind of strange what they spend their money on."

CANADIAN CLASSROOMS

Where has the money gone?

The cost of public education is shared by federal and provincial governments, but each province is responsible for running its own public education system. As such, investments -- calculated on a per-pupil basis -- vary from province to province. In total, about \$56 billion is spent on education in Canada each year.³

Despite variances between provinces, similar patterns have emerged beginning in the early 1980s. Per-pupil spending has declined steadily throughout Canada, since the average annual increase of 14.1 per cent experienced between 1975-76 and 1980-81.⁴

As the federal government has reduced transfer payments to the provinces in the 1980s and 1990s, the provincial funding base has dwindled accordingly. Provinces responded by reducing funding to school boards. As school boards across the country lost the right

³Thérèse Laferrière, Towards Well-Balanced Technology-Enhanced Learning Environments: Preparing the Ground for Choices Ahead September 1997 (<http://www.cmec.ca/reports/infoteche.stm>).

⁴Canadian Teachers' Federation, Spending per pupil in Canada remains sluggish 1999.

to tax in the 1990s, they were forced to reduce services as funding decreased. Overall per capita spending on education in Canada decreased seven per cent between 1994-95 and 1998-99 -- from \$2,147 to \$1,996. Over this period, expenditures fell by about \$1.9 billion -- a three per cent reduction.⁶ At the same time, expenses rose due to increasing salary and benefit costs as well as inflation.

Still, Canada's investment in education -- at all levels -- is among the highest in the world, as measured by the Organization for Economic Co-operation and Development (OECD). Per-student spending, from both public and private sources, amounted to US\$6,396 in 1996, the most recent year for which internationally comparable data is available, second to only the United States. The OECD average was US \$4,717. In 1995, Canada spent seven per cent of its gross domestic product on education, the highest among the G-7 countries, compared with an average of 5.6 per cent.

Yet, *Education Indicators in Canada* suggests higher expenditures in Canada and the United States may be partially due to higher rates of participation in post-secondary education. The report also notes that the 1995 data predates recent decreases in education spending in Canada. Even in 1995, however, the percentage of public spending devoted to education was below the OECD average in six of the 12 jurisdictions in Canada.⁷

According to John McEwen, chair of the education finance committee of the Ontario Secondary School Teachers' Federation, funding of Canada's K-12 education system has declined throughout the 1990s, to the point where it is now worse off than the American system.

There was a time when smug Canadians looked with pity and derision at underfunded American schools. How times have changed! Canadian schools, like other public institutions, have suffered continuous funding cutbacks for most of this past decade. In contrast, per-pupil expenditures in the United States have

⁶Canadian Education Statistics Council, Education Indicators in Canada: Report of the Pan-Canadian Education Indicators Program 1999 (Toronto: February 2000) 26.

⁷ Canadian Education Statistics Council 26.

risen steadily in the same period. Now Canadian schools are the poor cousin.⁸

Citing the Canadian Teachers' Federation, the U.S. Department of Education and the National Education Association as sources, McEwen reveals that in 1990-91, the average per-pupil expenditure in Canada was \$6,269 (about US\$5,394 compared with U.S. per-pupil spending of US\$5,486). By 1997-98, the latest year McEwen had figures for, the Canadian figure had risen to just \$6,987 (US\$4,808) while the U.S. average had climbed to \$7,254 in U.S. funds.

McEwen also compiled a per-pupil expenditures ranking of the U.S. states and Canadian provinces and territories. Canadian provinces were clustered at the bottom of the rankings. Other than the Yukon, which ranked 10th, and the Northwest Territories, which ranked 16th, the top-rated province was Ontario at 52nd. Quebec, Alberta, New Brunswick, Saskatchewan, Newfoundland, Nova Scotia and Prince Edward Island were at the bottom of the list, below all U.S. states. The funding numbers are consistent with those offered by the Canadian Teachers' Federation (CTF), with minor discrepancies.

The CTF has decried lack of funding for education for the past decade, arguing in 1999 that "per pupil expenditures in Canada have increased by less than half a percentage point in four of the last five years and have declined in six of the last seven years in real terms."

There are some exceptions, however. In Nova Scotia, per pupil funding actually increased five per cent from 1997-98 to 1998-99, according to the CTF. Having said that, however, Nova Scotia announced a \$53 million cut to funding in April 2000 that would have meant layoff notices for at least 590 teachers as well as other reductions in

⁸John McEwen, "Provinces' school spending falls below most U.S. States" The CCPA Monitor March 1999, 22.

⁹Canadian Teachers' Federation, "Critical Issues in Education and Technology" 28 Oct. 1999 (<http://ctf-fce.ca/e/what/restech/critical/htm>).

services.¹⁰ Following public pressure, the government reduced the planned cuts by about \$33 million. According to school board administrators, the decision will allow Nova Scotia to retain most of its teachers; however, trustees will still have to find about \$20 million in cuts.¹¹

Carole James, vice-president of the Canadian School Board Association, says school boards throughout the country are struggling.

"Fifteen of 60 school districts in B.C. have budgets in deficit figures, Nova Scotia just made huge cuts in its education budget, and Ontario's a mess -- everyone's in trouble."¹²

Where is the money going now?

Even as education budgets have been cut, governments across the country have made money available for technology.

While in some parts of the country money is being spent on hiring more teachers to reduce class sizes, eliminating portables and building new schools in growing suburbs, technology seems to be one of the few consistent growth areas in education-related government spending.

Nick Scarfo at the Ontario Ministry of Education, agrees technology is one of the few growth areas in education in which funding has increased over the past few years. He doesn't think that will change.¹³

"There's an ongoing concern or need to maintain the technology out there," he says.

¹⁰"Hundreds of teachers get layoff notices in Nova Scotia" cbc.ca 25 April 2000 (<http://cbc.ca/cgi-bin/templates/view/cgi?/news/2000/04/25/teachers000425>).

¹¹Kevin Cox, "Nova Scotia reverses position on funding," The Globe and Mail 6 May 2000: A2.

¹²Carole James, vice-president Canadian School Boards Association, phone interview, 7 May 2000.

¹³Nick Scarfo, Ontario Ministry of Education, education officer curriculum assessment and policy branch, phone interview, 19 May 2000.

“There’s a firm commitment to maintain funding at a level that will ensure students have access to technology.”

SchoolNet executive director Elise Boisjoly says the federal government spent about \$13 million a year between 1995 and 1998 and has budgeted up to \$25 million a year between 1999 and 2001 to link every library, school and school classroom to the Internet by March 2001.¹⁴ That’s just a portion of the costs, because provinces pick up most of the tab and private companies also make a contribution, Ms. Boisjoly says.

Heather-jane Robertson, director of professional development services for the Canadian Teachers’ Federation, concurs there is no published data documents on how much money provincial governments and school boards have spent on technology over the past decade, but argues that schools can’t spend more on technology without making deep cuts to other programs.¹⁵

Examples of spending on technology?

The Ontario government may have cut \$1.5 billion from education between 1995 and 1999, but at the same time the province spent \$135 million to connect classrooms to the Internet.¹⁶

In Alberta, premier Ralph Klein cut \$224 million from the education budget between 1993 and 1996.¹⁷ The government later announced spending of \$40 million per year on technology integration projects for 1995-1996 and 1997-98, and \$20 million for 1999-2000.¹⁸

In 1994, Quebec created the Fonds de l’autoroute de l’information (FAI). During the

¹⁴Elise Boisjoly, SchoolNet, executive director, phone interview, 31 Aug. 31 2000.

¹⁵Heather-jane Robertson, No More Teachers, No More Books (Toronto: McLelland & Stewart, 1998) 168.

¹⁶Gutstein 202.

¹⁷Gutstein 202.

¹⁸Council of Ministers of Education Canada, Developments in Information Technologies in Education 1999 (<http://www.cmec.ca/reports/edtech-en.stm>).

first phase of FAI, from 1994 to 1998, the FAI had a budget of \$50 million to meet four objectives: infrastructure modernization and development, support for industry partnerships, support for experimental projects, and support for co-operative projects on the Information Highway among Francophone jurisdictions. The second stage, from 1996-97 to 1998-99, had a budget of \$60 million to support the development of content on the Information Highway.¹⁹

British Columbia spent \$89 million on hardware and software between 1995 and 2000, to equip the K-12 system with information technology resources. It will have also spent a budgeted \$99 million between 1998 and 2004 to develop an infrastructure to support ICT use -- the Provincial Learning Network (PLNet). British Columbia also spent \$500,000 between 1997 and 1999 to evaluate ICT contribution to teaching and learning, and \$11 million between 1995 and 2000 on teacher training.²⁰

Cutbacks hit home

To argue that money is being taken from one area of education and moved directly into another would be unfair -- all social spending comes down to choice, and money being spent in one area could always be spent in another. But investments being directed into educational technology could be directed into other areas instead.

"There's only so much money," says Bernie Froese-Germaine, a researcher with the Canadian Teachers' Federation research and technology department. "Whenever you allocate a certain amount to technology, obviously other things that have proven to be successful will suffer."²¹

¹⁹Council of Ministers of Education Canada 25.

²⁰British Columbia, Information Technology in Education: Plan for 2000 and Beyond 1999 (<http://www.bced.gov.bc.ca/technology/plan2000/infotech1.htm>).

²¹Bernie Froese-Germaine, assistant researcher, research and technology department, Canadian Teachers' Federation, phone interview, 5 May 2000.

School districts, Carole James says, are having to make some difficult choices.

Take the situation in Greater Victoria as an example.

James, who in addition to her position within the Canadian School Boards Association is also a trustee in the Greater Victoria School District, says the budgeting process her district has gone through over the past few years is not unlike the situation experienced by school boards throughout the country.

Greater Victoria trustees grappled with a \$2.2-million deficit for the 2000-2001 school year. Among the programs cut back were elementary band and music (\$360,000), special needs education (\$176,000), funding for coaches (\$19,000), school supplies (\$327,000) and five full-time teachers (\$349,000). The elementary music program for stringed instruments was eliminated altogether, at an estimated savings of \$108,000.

The situation could be worse by the time September rolls around. Trustees were actually faced with a greater shortfall, but are hoping the provincial government will allow them to postpone their technology plan. If the Ministry of Education allows the delay, the district will save the \$783,000 it would have spent connecting all classrooms in the region to the Internet. So far, all schools are networked but not all classrooms are online.

If the province says No to the request, James says trustees will have to cut another \$783,000 from existing services to find that money. Either way, that money will need to be found the following year in order to meet ministry guidelines for Internet connection.

It's not the first year trustees in Victoria have been faced with cuts. In 1999-2000, they agreed to almost \$2 million in cuts -- including \$500,000 to special needs education, \$166,855 to supervision, and six full-time teachers (\$405,342) -- and received permission from the Ministry of Education to hold over the remaining \$1.5-million as a deficit while it attempted to find further cuts, possibly through the closure of four

schools. Trustees eventually decided not to close the schools, and were instead granted a three-year payback period by the province, during which time they were supposed to find a way to recoup costs through other methods, such as grade reconfiguration.

While provincial funding cuts have translated into cuts to music programs, special needs programs, teachers and supervisors in Greater Victoria -- and other school districts in the province -- money has been directed into technology.

In British Columbia in 2000-2001, the government will spend more than \$19 million on the upkeep of the Provincial Learning Network (the infrastructure that will link all B.C. schools to the Internet) at the K-12 level, \$10.2 million a year on direct grants for technology, \$6.25 million on indirect grants for technology, and \$1.5 million on teacher training.²²

Denis Semair, manager of educational technology for the Greater Victoria School District, says the district spends a further \$225,000 per year on software, hardware and technical support. In addition, the 51 schools in the district share about \$800,000 through the Learning Resource Fund -- which they can spend on software, textbooks or library books -- and another \$350,000 for software or hardware through the Technology Trust Fund. Another \$70,000 is spent on teacher training.

It's tough to get an exact estimate on how much money is spent on technology in the district because, as Semair says, schools receive money through trust funds and can choose individually how to spend those dollars. Some schools, he says, spend it all on technology while others choose to spend elsewhere.

Perhaps not surprisingly, given his position within the school district, Semair would like to see more money spent on technology.

²²Rick Withers, manager, educational technology branch, B.C. Ministry of Education, phone interview, 23 May 2000.

"There's not a lot of money out there," he says.

Carole James says Greater Victoria lags behind some of the other districts in B.C. when it comes to technology, but says trustees aren't willing to sacrifice other programs in order to obtain computers.

"In this community, we've strongly supported a variety of other programs for our kids. Music is strongly valued, and special education," she says. "We've chosen to support (those programs), and we haven't put the money into technology that other districts have."

School districts that have chosen to spend more money on technology, James says, have necessarily let other programs slide because there's only so much money to spend.

School districts often feel pressured to spend money on technology rather than other programs, James says, because they receive money from the province that is specifically targeted towards technology.

The Ministry of Education's Rick Withers agrees that school districts do feel pressured to spend money on technology. Technical support, for example, is funded at the local level rather than provincially -- which means school boards need to divert funds to this area if they want information technology to be used efficiently.

"It's very good in some districts, and very bad in others," Withers says.

Provincial funding often only covers basic costs, James says.

"Targetted technology funds can get you started, but you can't go forward," she says. By way of example, James points to the Provincial Learning Network (PLNet). School districts had to reallocate existing budgets in order to get connected to PLNet and the Internet, because provincial funding failed to cover the costs of equipment or staffing needed inside the school to actually set up the network. In Victoria for the upcoming year, the cost amounted to the \$783,000 expense trustees are now hoping to postpone for

another year.

The revelation that school districts had no choice but to spend money in this area angered some Greater Victoria parents, including Sherry Ridout. Although Ridout said Internet access might be a positive step, she wasn't happy her district wasn't given a choice.

"The point is that when the government earmarks money for a specific purpose, it doesn't free the individual districts to spend where funds might be more urgently needed," she says. "In this case, they are placing specific criteria on funding that might be needed elsewhere."²³

It's not easy to move money from one part of the budget to another, James says. The cuts don't go unnoticed because school districts in most provinces only have discretion over how three to four per cent of their budget is going to be spent.

"That's more and more the norm across the country," James says, adding Saskatchewan and Manitoba are the exception as school boards there still have the ability to tax.

Even in provinces like Saskatchewan, where school boards can raise money through municipal taxes, difficult decisions are still being made. Trustees in Saskatchewan are faced with budget cuts for the 2000-2001 school year, despite an \$18-million increase in funding which they say won't even cover rising salary costs.

"They are caught between a rock and a hard place," says Gary Shaddock, president of the Saskatchewan School Trustees Association.²⁴ He says trustees there are looking at reducing staff, closing schools, cutting back on building maintenance, school supplies, school bus purchases, extracurricular activities, programs and other areas.

²³Sherry Ridout, Greater Victoria School District parent, personal communication, 18 April 1998.

²⁴Saskatchewan School Boards Association, "Some boards may have to raise mill rates or make cuts," 19 April 2000 (<http://www.ssta.sk.ca>).

In Ontario, meanwhile, the government will have invested \$130 million in the technology needed to network classrooms, schools and school boards during the 1999-2000 and 2000-2001 school years, says Ministry of Education official Nick Scarfo. The government transfers money, which is to be used for technology use only, to each school board in the province based on enrollment.

In the case of the Ottawa-Carleton District School Board, that will work out to about \$3.4 million in the 2000-2001 school year, says Dan Cousineau, the district's business and learning technologies manager.²⁵ The district's budget for technology will be brought to about \$10 million in 2000-2001 -- not counting salaries -- as the board will allocate an additional \$6.6 million to technology. Of that money, \$3.4 million will be transferred directly to the district's 150 schools -- and 48 per cent of that will be spent on contracts for school services such as school phones, network communications and Internet access.

Technology hasn't been immune to cutbacks in the Ottawa-Carleton District School Board. Prior to the amalgamation of the Ottawa and Carleton boards in 1998, for example, there was a 25 per cent reduction in both staffing and operational dollars in the technologies department, says Cousineau. But all departments suffered a similar decrease.

Since then, investments in technology haven't grown, but they've remained stable. And that, Cousineau says, means schools can expect more of the same in terms of what technology funding buys them.

"Due to budgetary limitations and with the constant and growing demand on Internet access, more computers and expectations, we have little room for growth and (new) expenditures in technology," Cousineau says.

The same can't be said for other parts of the Ottawa-Carleton Board budget, where

²⁵Dan Cousineau, manager business and learning technologies Ottawa Carleton District School Board, e-mail interview, 25 May 2000.

services are being cut back. Trustees have cut \$18 million from their budget for the 2000-2001 school year -- to \$510 million from \$528 million a year earlier, and \$540 million the year before that cut.

The cutbacks do have a direct effect on the type of education students receive.

In Ottawa-Carleton, 43 of the current English-as-a-second-language teachers will be laid off in the 2000-2001 school year, as the district tries to conform to new provincial funding guidelines. The new formula -- which cuts back on the money spent on ESL programs -- provides no ESL for children born to immigrant families in Canada, even if their parents don't speak English. It will also fund a maximum of three years of ESL, compared with the current seven.²⁶

An editorial in the *Ottawa Citizen* criticized the new funding policy, saying:

"Second-language training may rate lower than new textbooks or better school facilities, but at the very least, the provincial government's ESL funding formula should reflect when a student enters the school system, not when some are still in a playpen."²⁷

The cuts to ESL in Ottawa-Carleton come despite the fact that the number of ESL students in the area has risen by 10 per cent in the last three years (8,800 from 8,100 in 1997-98). The province of Ontario provides funding for 3,300 ESL students in Ottawa-Carleton.²⁸

"If a child does not master English, all their schooling suffers," said Mitchell Kitagawa, president of the Ottawa-Carleton Immigrant Services Organization, who spoke on behalf of ESL students at a March 20 budget meeting.²⁹

Special education parents, meanwhile, worry their children will lose the support they

²⁶"ESL training faces money crunch" *Ottawa Citizen Online* 12 April 2000 (<http://www.ottawacitizen.com/editorials/000412/3916510.html>).

²⁷"ESL training faces money crunch."

²⁸ESL training faces money crunch."

²⁹Jaimet 2000.

need to succeed in regular classrooms with funding cut by a further \$1.6 million for the upcoming school year.

In an interview with the *Ottawa Citizen*, Bronwyn Funicello said her daughter Stephanie, who has language-based learning disabilities, hasn't fared well in regular classrooms since being removed from a special class at Evelyn School in Ottawa East after funding cuts in 1999-2000.³⁰

Funicello said her daughter came home from school crying, because she couldn't keep up with other children. Stephanie told her: "I just wish I could get a sharp knife and stick it in me to make me die."

Stephanie is eight.

High costs of technology

Technology isn't cheap -- but according to government officials, the public is demanding it.

"You'd be hard-pressed to find groups out there who don't value technology in the classroom," says Ontario education officer Nick Scarfo.

In order for technology to be used effectively, there are various expenses that must be met.

Take the wiring of classrooms -- which isn't cheap, especially when older schools need retrofitting first.

"In Canada, many school buildings erected in the 1950s and early 1960s are aging and were certainly not conceived for travel on the electronic information highway," writes the Canadian Teachers' Federation's Bernie Froese-Germaine.³¹

³⁰Jaimet 2000.

³¹Bernie Froese-Germaine. "Taking another look at education and technology (Part 4)" CTF News Service 11 Feb 1998 (<http://www.ctf-fce.ca/e/press/pr20.htm>).

And expenses go beyond wiring classrooms. They also go beyond computer hardware and software.

According to Henry Jay Becker, a respected American researcher in the field of technology and education, a significant investment must also be made in teachers and other staff like technology coordinators. He estimates that, for a school of 800 students and 40 full-time staff, it would cost nearly US\$2,000 per student per year in addition to current educational expenditures to maintain computerized classrooms.¹²

Some say even that sum won't be enough for computerized classrooms to be truly effective.

A report to the U.S. National Information Infrastructure Advisory Council, prepared by management consulting firm McKinsey & Company, estimated that the amount of money invested on instructional technology in the U.S. would have to triple for networked computing to reach a level of real usefulness in schools. The report estimated that between 1.1 per cent and 2.2 percent of total spending would have to be invested in instructional technology every year for a decade.¹³

Canada's move to computerize schools is at about the same stage as the U.S. which has about one computer for every seven students. This allowed Froese-Germaine to analyze McKinsey & Company statistics in Canadian terms.

"Putting this in a Canadian context, two per cent of total spending on K-12 education in this country for 1996-97 is approximately \$690 million -- this is the amount that would have to be spent every year for a decade," Froese-Germaine writes.¹⁴

Industry Canada's Doug Hull agrees that computerizing Canada's schools will be expensive.

¹²Froese-Germaine 1998.

¹³Froese-Germaine 1998.

¹⁴Froese-Germaine 1998.

"It does require a lot of extra work and extra resources, and largely unguided because there aren't a lot of people around who know the right methods," he says.¹⁵

But Hull says waiting for research that proves computers will help kids learn -- or waiting for prices to come down -- would be a mistake.

"We'll be way, way behind where we need to be competitive in the world in terms of learning and also just to live in a competitive and productive country," Hull says.

One time cost?

Perhaps governments could fully computerize schools in one big investment or gamble on reduced costs after the first few years.

Not likely, says Froese-Germaine.

Anyone who has ever owned a computer knows it doesn't quite work that way. The corporate sector, particularly the high-tech industry, understands this all too well. A recent issue of *Forbes* magazine reported that the typical networked PC costs \$13,000 a year for a corporation to maintain. In addition to computer hardware and software, technical support and system administration, this calculation includes the cost of the time the user spends "futzin'" around with the machine -- that is, organizing the hard drive, installing software, waiting for the printer, waiting for the technician, playing Solitaire, and unproductively surfing the Internet. *Forbes* notes that "the hardware, of course, is just the tip of the iceberg. Training, hand-holding and upgrading software are all hugely expensive." If big business has concerns, one wonders where this leaves schools and other public institutions.¹⁶

In another *Forbes* magazine article published in 1998, columnist Diane Ravitch questioned the ongoing costs of computerized classrooms in the United States.

"The \$5 billion spent this year on computers in schools is only the tip of the iceberg, because almost all of that money goes for hardware," she wrote. "Given the pace of technological change, the tab will rise steadily, as equipment purchased ten -- even five --

¹⁵Hull, Doug, interview, *The Wired Classroom*, Canadian Broadcasting Corporation, cbc.ca April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

¹⁶Froese-Germaine 1998.

years ago becomes obsolete.”³⁷

Berkeley professor and author Clifford Stoll is just as pessimistic.

“Within two years, the value of a computer drops in half,” he says. “Within five years, it’s pretty much been superseded. And within a decade, you find them in goodwill.”³⁸

Says trustee Carole James: “Businesses are able to keep up, but you could never do that in the school system.”

The Council of Ministers of Education Canada outlines several concerns about the implementation of information technology in education, some of which revolve around on-going expenses, in *Developments in Information Technology in Education*. The report says, in part:

Funding continues to be a central issue. To provide technology-enriched learning opportunities for all students in an equitable manner requires huge investments by provincial and territorial governments. There is a high cost of producing quality software to help students achieve the outcomes of the curriculum, including technology outcomes. Implementation costs are compounded by rapid obsolescence of technologies. The education systems are attempting to develop ways to commit a portion of the cost of new technologies to an annual replacement fund. Alternatively, some jurisdictions are considering rental, rather than the purchase, of computers to address the issue of obsolescence.³⁹

Furthermore, the report suggests that more money will need to be spent on teacher education, since the focus has inevitably fallen first and foremost on the basics of hardware, software and connectivity. Teachers, however, must have training programs so they are comfortable with the technologies and able to use them effectively as teaching tools.

These ongoing costs are expensive.

³⁷Diane Ravitch, “The great technology mania” *Forbes* 23 March 1998 (<http://www.forbes.com/forbes/98/9323/6106134a.htm>).

³⁸Clifford Stoll, *Silicon Snake Oil: Second Thoughts on the Information Highway* (New York: Doubleday, 1995) 70.

³⁹Council of Ministers of Education Canada 30.

In 1995, the U.S. Office of Technology Assessment report estimated that, in the United States, one-time installation costs (including teacher training) could range from \$0.08 billion (for one personal computer plus modem per school, connected to the Internet through a school-district-based file server) to \$1.45 billion (for one personal computer per student desktop, with full connection to the Internet for text, audio, graphical and video applications). Annual operating costs (including annual training and support for teachers) was estimated at a range of \$0.16 billion to \$11.28 billion, depending on the number of computers per school. Canadian costs would be about one-tenth of these figures.¹⁰

Rick Withers, a manager with the educational technology branch in B.C.'s Ministry of Education, says costs needn't be that high. He says technology needs to be used effectively -- and that doesn't necessarily mean it will be expensive.

There will be ongoing costs, Withers says, but they don't have to climb.

"It's important to keep technology current enough to run the applications that they're running," he says. But when you're talking about word processing programs, spreadsheets and various Web browsers, you don't have to have the most current applications. The 1995 version of Microsoft Word 5.0, for example, is more than adequate for word processing at the Grade 6-9 level, he says.

In addition, he sees no reason why computers can't be divided into different work stations -- with older computers and older programs used for word-processing, and newer computers used for researching information on the Web.

Withers also says governments may want to rethink where they're spending money on computers. This drive to put computers into every classroom, he says, may not be the most beneficial way to spend money.

¹⁰Froese-Germaine 1998.

"We're really focusing on effective implementation now," Withers says of British Columbia's new policy, which will take effect in July 2000. "There may still be an overall increase in the number of computers, but more importantly an increase in effective use."

In B.C., that means technological resources will now be directed to the Grade 6-9 level. At that age, Withers says, students are expected to develop independent research skills and information literacy -- so computers tie nicely into the curriculum and should help students develop the skills they're expected to learn.

"It's so much more real than developing information literacy skills when you only have one set of encyclopedias available and everyone's finding the same information," Withers says.

Withers says the funding decisions come down to spending money where it will have the most impact.

"We want to do more with less. It may sound funny, but it means doing a better job and doing more with your resources," he says. "There's a more balanced consideration of what technology can do and where it isn't really making a difference right now. I'd be pleased to think that we'd be doing more with the same in a year or two rather than growing."

According to U.S. educational psychologist Jane Healy, however, there may be long-term costs down the road that school administrators have not yet considered.

For example, while computers have been pulled into classrooms and labs, the furniture on which many of these computers rest hasn't changed accordingly. As a result, Healy says, school children often use old machines, work at poorly-designed or non-existent work stations, work under antiquated lighting and read off small computer screens, due to inadequate education budgets.

In all the classrooms observed in Chapter I, computers were located at traditional classroom desks in front of traditional classroom chairs in rooms illuminated with fluorescent lights.

As of yet, Healy says, the research cited in adult occupational literature hasn't been carried out in studies of children's computer use -- vision, wrist and back problems as well as the highly controversial subject of electromagnetic radiation. Government reports on adult health in the U.S. indicate workers who spend more than half of their work days in front of computer screens have significantly higher health problems than workers who rarely use them -- both vision and musculoskeletal problems.⁴¹

As more kids spend more and more time on computers, Healy says, the concerns become more urgent.

"Health effects are assumed to be cumulative -- that is, something that might not hurt you in small doses can become damaging over a long period of time... If something is harmful to full-grown adults, it may carry even greater risk for the developing child, as fast-growing biological systems are the most vulnerable to damage," she writes.⁴²

Cost-savings?

It's not as though schools are going out and spending indiscriminately. It's not often that computer labs, for example, will be filled with top-of-the-line computer equipment. There may be some iMacs in schools, but there are also antiquated Apple IIe's and old PCs. In general, the computers appear to be a few years old.

Part of the reason for this is that the federal government has tried to keep hardware costs as low as possible through the SchoolNet program "Computers for Schools."

⁴¹Jane M. Healy, Failure to Connect: How computers affect our children's minds -- for better and worse (New York: Simon & Schuster, 1998) 110.

⁴²Healy 111.

Launched in 1993 by Industry Canada and Telephone Pioneers, the program encourages businesses or individuals to donate surplus computers, computer equipment or software to schools or libraries. The equipment is then refurbished through a program funded by the federal and provincial governments. Volunteers from the private sector work alongside recent technical graduates who obtain work experience by fixing up the old computers. The computers are then delivered to schools or libraries. Schools with low financial resources or low current computer inventory are given priority. The goal of the program is to place 250,000 computers in classrooms and public libraries by March 31, 2001. As of April 30, 2000, according to the SchoolNet Web site, the program had placed 201,185 computers in schools.

The older computers may work well for word-processing, but many are not powerful enough to access the Internet. As teachers are quick to point out, people usually get rid of equipment when it is outdated. It's also difficult to run industry-standard software on outdated machines.

"There's a warm fuzzy feeling when these computers come in, but unfortunately many of them can't run the more powerful software," says Denis Semair, manager of educational technology for the Greater Victoria School District. "They can be used for word processing, but that's about it."

When computers are too old, Semair says, you end up spending more on servicing and upkeep than they are worth.

However, Jim Coombs, principal of Broadmoor Junior High School in Sherwood Park, Alberta, says computers do allow schools to save some money.

His school, for example, hasn't bought new reference books since computers were added to the library -- and he's not blaming government cutbacks even though, after

inflation, school library budgets have been cut 75 per cent over the last 25 years.⁴³

Instead, Coombs's school is purchasing much cheaper CD-ROM references works -- including encyclopedias -- which can easily be replaced each year to provide students with the most up-to-date information. When it comes to reference materials delivered through computers, schools don't have to worry as much about students having unequal access to it according to their financial status -- students have never been able to check reference books out of libraries.

In addition, through SchoolNet, schools can purchase software and other computer equipment at reduced costs from SchoolNet sponsors. Many provincial governments have made similar arrangements with companies. In British Columbia, for example, schools can buy the "Success Maker" program -- the No. 1 educational software package in the world in terms of sales -- at a cost of \$1,400 per licence. If schools didn't get the group rate through the government, they'd be paying \$4,500 per licence.⁴⁴

But Coombs says computers have also brought added expenses.

His school was originally equipped with Macs. But with district-wide networking, he says his school had to switch over to IBMs. The budget program used by administrators is also an IBM version, and the Alberta Education Department sends all its material as Microsoft Word documents -- again, an IBM program.

"It was expensive," Coombs says, of the replacement process.⁴⁵

Lillooet Secondary School in B.C. experienced a similar situation when the school district it was once part of amalgamated with another school district. Lillooet Secondary also used to have Macs, but because the other school district was mainly IBM they needed to switch over. At first computer teacher Paul Belland, information technology

⁴³Heather-jane Robertson, No More Teachers, No More Books (Toronto: McLelland & Stewart Inc., 1998) 55.

⁴⁴Semair.

⁴⁵Jim Coombs, Broadmoor Junior High School principal, phone interview, 30 April 2000.

coordinator for his old school district, thought that would mean all the old Macs could be used in a computer lab, but that wasn't to be the case. To get funding for the new computers, Belland says, the school had to get rid of the Macs -- so they were sent to the local elementary school, despite the fact his school wanted to keep them.

The high school then had to buy new software for the IBMs, which "is not funded, or budgeted for."⁴⁰

Ross Mutton, president of the Association for Media Technology in Education in Canada, says it's misleading to argue that computers will ever lead to a less expensive education system.

"It's not going to save money in spite of what any bureaucrat or politician may think," he says. "But we'd like to make sure it doesn't cost more... It's not an easy time to find money, and it's not likely to get any better."⁴¹

WHAT'S BEING LEFT BEHIND?

South Carleton's student trustee Justin Millette uses computers frequently.

He says he's not an expert, but he has a laptop at home which he uses for word processing. He took an animation course at school in Grade 11, which was taught primarily on the computer. He can find basic information on the Internet, although he wishes he knew more about it. And at least once a day he uses BEAM -- the school district's e-mail program -- to see if he's received any information he needs to be aware of as a student trustee.

The school's library, he says, is in good shape. There are lots of books, and it doesn't seem to have been relegated to a second-class information source, even though the school

⁴⁰Paul Belland, Lillooet Secondary School teacher, personal interview, 13 Dec. 1999.

⁴¹Ross Mutton, Association for Media Technology in Education in Canada president, personal interview, 20 March 2000.

now has a couple of computer labs, and one or two computers in each classroom.

But the school itself is in need of repairs, and Millette sympathizes with parents who attend budget meetings time and time again to argue for their causes -- particularly those arguing for increased special needs education funding.

Millette has cerebral palsy, and admits special education is "dear to my heart."

Still, he says, everyone has their own biases, including the Special Education Advisory Committee to the board.

"You want to hear what they're saying, but you want to know what they're saying isn't made up," Millette says. "Everyone has their own agenda and cause."

So too do people promoting technology in schools -- and he's not convinced it's the right agenda.

"I think it's (computerized education) a good thing, but it shouldn't get in the way of teaching," he says.

He also thinks computers may be too costly an investment, given other needs.

"Technology's always advancing," he says. "They're always going to have to update their stuff. But if they put money into upkeep or special ed -- bit by bit -- I think that would be more beneficial."

There are many people -- representing what Millette would call many different causes, from advocates for music in schools to those fighting school closures -- who'd agree money might be better spent elsewhere.

As U.S. columnist Diane Ravitch wrote in *Forbes* magazine, computers in schools "smells suspiciously like the latest miracle cure."

"The nations that regularly leave us in the dust on academic tests -- like Korea -- have focused on good teaching, not on technology," she writes. "There is no evidence that use of computers or the Internet improves student achievement. Yet the billions spent on

technology represent money not spent on music, art, libraries, maintenance and other essential functions.”⁴⁸

Says Mutchmor Public School principal Barbara Campbell in Ottawa: “There isn’t enough money for boards to do discretionary things. So additional money for field trips, breakfast programs, and other special things -- that’s all gone.”

There’s evidence to suggest that many of these programs may be just as worthy of funding as technology. What follows are some of the stories.

Musical malpractice

From a child whose hands were too small to play a stringed instrument, to a former professional musician schooled in the Dirty ‘30s, Greater Victoria school trustees heard a chorus of cries on April 14, 1999 about the benefits of the elementary school strings and band program.

“I’m not an expert in the development of the human mind, but music has done many things for me... including giving me the self-confidence to speak out on things I believe in,” said Michael VanInsbergh, a Grade 6 student at Torquay Elementary School who had recently moved to the district from West Vancouver.⁴⁹

The composed, well-spoken flutist had taken music classes since kindergarten in his former school district, and told the board he had trouble imagining elementary schools without the program.

“Music is the common thread that links people from around the world,” he said.

⁴⁸Ravitch 1998.

⁴⁹Bev Wake, “SD61 faces up to some tough choices,” Victoria News 21 April 1999: 1.

VanInsbergh was one of about 300 people who packed the auditorium at S.J. Willis School in Victoria to have their say on a list of proposed budget cuts for the 1999-2000 school year. The board faced a \$3.5-million funding shortfall, and needed to find \$2 million in cuts.

Trustees presented the public with a list of possible cuts totaling \$3 million. More than 60 people spoke at the first two public hearings on April 14 and 15.

The cuts to elementary music programs -- band and stringed instruments -- would save the district \$410,273 annually. The majority of people at the hearing were there to speak about the benefits of that program.

It's not the first time parents in Greater Victoria have spoken out against proposed cuts to music programs. Nor is it an outcry limited to B.C.'s capital city.

At Mutchmor Public School in Ottawa, funding cutbacks have reduced arts programs to the extent that students are now taking music, drama and visual arts programs during their lunch break. Principal Barbara Campbell says the school is in the process of setting up a "pay-per" student art program at lunch.

"There's an overwhelming demand for this," Campbell says, while acknowledging her school is lucky. Because Mutchmor is located in the Glebe, a fairly wealthy section of Ottawa, children can afford to pay for special programs. In other schools, such programs would discriminate against students from less-affluent homes.⁴⁰

There is academic evidence that suggests music can act as a "magical medium" -- perhaps even moreso than computers. The theory became the subject of Don Campbell's book *The Mozart Effect*. Campbell, a Texan who studied classical music in France and

⁴⁰Barbara Campbell, Mutchmor Public School principal, personal interview, 8 May 2000.

founded the Institute of Music, Health and Education in 1988, argues that music is good for people physically, emotionally, spiritually -- and intellectually.

"The more stimulation a child receives through music, movements, and the arts, the more intelligent she or he will turn out," Campbell says.⁴¹

In *The Mozart Effect*, Campbell cites several studies to back up his belief that playing an instrument or participating in a music program in school has positive effects on learning, motivation and behaviour.⁴²

- One U.S. study involved the observation of 34 preschool children given piano keyboard training. The children learned pitch intervals, fine motor coordination, fingering techniques, sight reading, music notation and were expected to play music from memory. "After six months, all the children could play basic melodies by Mozart and Beethoven." Campbell writes. "They also exhibited dramatic enhancement in spatial and temporal tasks (up to 36 per cent improvement) compared to twenty children receiving computer lessons and twenty-four children provided other stimulation."⁴³

- A Texas study found that students who participate in orchestras have Scholastic Aptitude Test (SAT) scores that are higher than average⁴⁴;

- The College Entrance Examination Board reported in 1996 that students with experience in musical performance scored fifty-one points higher on the verbal part of the SAT and thirty-nine points higher on the math section than the national average⁴⁵;

- In a comprehensive review of hundreds of empirically based studies between 1972 and 1992, three educators associated with the Future of Music Project found that music instruction aids reading, language (including foreign language), mathematics, and overall

⁴¹Don Campbell, *The Mozart Effect* (New York: Avon Books, 1997) 179.

⁴²Campbell 177.

⁴³Campbell 16-17.

⁴⁴Campbell 176.

⁴⁵Campbell 177.

academic achievement. The educators also found that music enhances students' creativity, improves social skills, and "increases perceptual motor skill development and psychomotor development"";

- Another U.S. study suggests that "elementary students who received daily musical instruction had fewer absences than other students, and courses in music, as well as art and drama, positively influenced the decisions of high school students not to drop out of school.""

Special needs requirements

The Ottawa Carleton District School Board plans to cut \$1.6 million from its special-needs programs this year -- programs that encompass a wide-range of requirements, from behaviorally challenged to gifted to mentally challenged students.

It's not the first time Ottawa-area trustees have cut special needs programs, and according to Mutchmor Public School principal Barbara Campbell the cuts have hurt students.

"Specifically, we have two children that have very, very severe learning needs who had been in a self-contained class," Campbell says, explaining that budget cuts forced the children to be integrated into regular classrooms. "Now, they're in a regular class and are withdrawn for half a day. They make gains when they're not in the regular class. For those two particular children, (integration) hasn't been successful at all. I'm continuing to fight for them -- but to fight is very, very difficult."

The situation is similar in Greater Victoria, where parent Leesa Flynn attended budget meetings for the 1999-2000 school year to speak about the benefits of special-needs education.

"Campbell 179.

"Campbell 181.

The district had proposed cuts totaling \$1 million annually from special needs, but ended up cutting half that.

"The children in my son's class have learned tremendously because of one special-needs person in the class," Flynn said. "I see them with this one little girl and it amazes me, especially the boys who are body-slamming each other and then go up to this one little girl and say 'hi, how are you honey'. You can't teach that."⁸⁸

The benefits of special-needs education -- for all students -- were repeated time and time again at budget meetings.

Richard Motchman, whose daughter Meliah is a special-needs student in Grade 3 at Sundance school in Victoria, says cuts to special-needs education can be dangerous for special-needs students.

"When you cut student assistance funding, you're getting into scary issues for my daughter's life," Motchman says.

Meliah, who has Down's Syndrome, has dangerous habits which make supervision necessary, he says. She likes to leave school, she likes to climb into cars that aren't her own, and she likes to hug the legs of men she doesn't know.

"That's a scary combination if she leaves school," Motchman says, adding Meliah has left school in the past and less supervision makes it more likely she'll be able to do so again.

Physical education

⁸⁸Bev Wake, "Special needs programs in jeopardy," Victoria News 28 April 1999: 5.

Brentwood Bay Elementary School on Vancouver Island has a computer lab. But it came at a cost. The lab is located in what used to be the smaller of two gyms at the school. This is not uncommon.

Educators say that physical activity is one area that has suffered as education funding has been cut. Lillooet Secondary School teacher Paul Belland, for example, says that while money is being spent on technology, sports and extra-curricular activities are suffering.

The consequences could lead to a generation of unhealthy children.

"Youth are spending an increasing amount of time sitting -- at school desks, watching television, playing video games and surfing the net," says Rick Turnbull, executive director of the Canadian Intramural Recreation Association. "These activities, combined with the diminishing priority of physical activity in Canadian schools, mean that growing numbers of young people are leading sedentary lives."⁴⁰

The Heart and Stroke Foundation, following its release of the first-ever Heart and Stroke Report Card on the Health of Canada's Kids in 1998, recommended that parents encourage their child's school to offer quality daily physical activity -- through increased frequency of physical education classes, intramural activities, extracurricular activities or a combination of all three.⁴¹

The report gave children aged six to 12 a grade of "C" on their levels of physical activity. The study found that while 63 per cent of children that age do get enough physical exercise, almost one in three Canadian children do not get the activity they need to develop cardiovascular fitness, muscle strength and flexibility. On average, Canadian

⁴⁰Heart and Stroke Foundation of Canada, Kids get poor marks on Foundation health survey 1998 (<http://www.na.heartandstroke.ca/cgi-bin/English/LatestNews/Public/nD.cgi?1::3::30::00000000::00000000>)

⁴¹Heart and Stroke Foundation of Canada, "Key Points" 1998 (<http://www.na.heartandstroke.ca/cgi-bin/English/Catalog/Public/bR.cgi?540570>).

children watch 2.4 hours of television today -- and sit idle behind schools desks for about six hours per day.⁶¹

The foundation report expressed concern that, if childhood habits aren't altered, these children could be headed for an unhealthy adulthood.

"There's evidence that many bad habits only get worse with age," the report read. "For example, being sedentary increases dramatically as kids enter their teen years, and the overweight child is at increased risk for obesity later in life."

According to a 1998 study published in the *ERIC Digest*, schools that promote physical activity may have a significant impact on reducing childhood obesity, chronic disease and adult mortality.⁶² In addition, the study found regular physical activity can lead to a reduction in chronic disease risk, prevent hypertension and reduce blood pressure, lower the risk of colon cancer, increase bone density, reduce anxiety and improve body image, promote weight control and increase academic performance and mental health.

The study further suggests only one-quarter of high school students participate in daily physical education, and only 19 per cent of high school students are active for at least 20 minutes a day during physical education class -- far less than the recommended 30 minutes of moderate intensity activity per day for adolescents and adults and 60 minutes for children.

"Physical education, provided at school, is an ideal way to encourage activity and develop fitness among children and, for many children, will be their only preparation for an active lifestyle," the study reads.

Nutrition education and breakfast programs are equally important. But, as Mutchmor

⁶¹Heart and Stroke Foundation of Canada. "Kids get poor marks."

⁶²Liane M. Summerfield. "Promoting Physical Activity and Exercise among Children." *ERIC Digest* 1998 (http://www.ed.gov/databases/ERIC_Digests/ed416204.html).

Public School principal Barbara Campbell says from Ottawa, there's little discretionary money available any more to cover the costs of breakfast programs.

A June 1994 report, also published in the *ERIC Digest*, reported the results of several studies which link the effects of hunger and poor nutrition to cognitive abilities.⁴³ One study found that among Grade 4 students, those who had the least protein intake in their diets had the lowest achievement scores.

A different laboratory study of healthy, well-nourished school-aged children found a negative effect of morning fasting on cognitive performance. A test of speed and accuracy on problem-solving tests given to students who skipped breakfast found that skipping breakfast led to adverse results -- regardless of whether they skipped breakfast on a regular basis.

The report also suggested that children who are hungry or undernourished had more trouble fighting infection, and were therefore more likely to become sick, miss school, and fall behind in class.

Counselling services

If Greater Victoria's 1999-2000 budget debates had been held at a different time of the year, at least one of the decisions may not have bothered Linda MacAdams quite as much.

MacAdams, president of the Victoria Confederation of Parents' Advisory Councils, was troubled by a \$166,855 reduction in supervision at the secondary school level. The decision was made the week of April 20th, the same week Dylan Klebold and Eric Harris burst into their Littleton, Col. high school and killed 12 of their classmates and a teacher

⁴³ERIC Clearinghouse on Elementary and Early Childhood Education. "Children's Nutrition and Learning." *ERIC Digest* June 1994 (http://www.ed.gov/databases/ERIC_Digests/ed369579.html).

while wounding 23 others.

"I'm very worried for our kids," MacAdams says.⁶⁴

The cuts reduced hours of supervision to 184.75 hours a week from the previous 369.5 hours a week. As MacAdams says, it's not that the violence in Littleton couldn't occur in Victoria -- less than two years earlier, a group of teenage students beat and drowned their 15-year-old classmate Reena Virk.

Ottawa-Carleton student trustee Justin Millette shares MacAdam's opinion. Interviewed just hours after an Ottawa teen stabbed and injured four students and a teacher at Cairine Wilson Secondary School on the one-year anniversary of the Littleton shooting, Millette says students have suffered as counselling services have been cut.

"It affects it big time," Millette says of cuts. "I've seen a big difference between last year and this year. (Trustees) have just approved the budget for next year, and I don't know how it's going to look."

One of the biggest changes Millette has noticed at the high school he attends -- South Carleton, which serves rural communities like Stittsville and Carp west of Ottawa -- is the lack of time the school psychologist is on campus. Due to funding cuts and the resulting reorganization of how services are delivered, Millette says the new psychologist spends less than two days a week at the school, splitting her time between four other schools.

"If they're always moving around, how do they know who's important?" Millette asks. "It's better to have the same psychologist, the same social worker through high school."

"The level of service has really gone down," he says. "I believe (psychologists) are very important for some students. It's been proven they get them through their day, their

⁶⁴Bev Wake, "Funding cuts put student safety at risk," 23 April 1999: 1.

month, their year. (Psychologists) need to be there on set days. It would be a good thing.”

Brushing aside such concerns, says MacAdams, ignores the realities of school life.

“There is violence in our schools, there are gangs,” MacAdams says. “We need to keep an eye on these kids.”

Secondary school supervision should have been the first item removed from the list of cuts in Greater Victoria, MacAdams says.

Portable classrooms

Dawn Smith-McRae’s first reaction is a frustrated smirk, when asked how computerized her daughter’s high school is. It’s understandable. It would be difficult to wire a school like Holy Trinity in Kanata, Ont. The school was built for 980 students, and now houses 1,462 in Grades 7 through OAC. While there’s still room to play a soccer game on the school field, it’s cramped. There are 24 portables on the property, 12 free-standing portables and 12 in what Smith-McRae calls a porta-pak.

“It isn’t possible to wire portables,” Smith-McRae says. “Students can’t have computers, air conditioners or anything else that can’t be tied down, due to vandalism.”⁶⁴

Smith-McRae is chair of Holy Trinity’s Catholic School Council. The school has been open for 10 years, and the only year it didn’t have any portables was the first year it was open. In 1998-99, there were 30 portables on the property. That year, students were taking phys ed classes in the parking lot. Even now, because Holy Trinity has about one-third more students than it can hold, some students arrive at school but never actually go inside.

Getting computers into classrooms is the least of Smith-McRae’s worries. There’s no way students should be forced to work in portables, she says. Her argument, one she’s

⁶⁴Dawn Smith-McRae, Holy Trinity Catholic High School council chair, personal interview, 26 April 2000.

made to a number of audiences as the Ottawa-Carleton Catholic School Board held a series of hearings on school closures and restructuring in the spring of 2000. is convincing. The portables, she says, smell of fish and dead animals. The circulation is bad. In the winter, students freeze. In the late fall and spring, they swelter. There is no air conditioning.

Do the conditions affect students success?

"Definitely," Smith-McRae says.

Ottawa isn't the only city in Canada to school students in portables.

In the spring of 1998, the B.C. Ministry of Education announced \$338 million in funding to create 17,200 new spaces for students in 1998-99, and cut the number of portables in the province in half within five years.

Overcrowding, regardless of the number of portables, can cause problems. Students, Smith-McRae explains, have limited access to extra-curricular activities because of the intense competition for limited spots on sports team.

It's also difficult, she says, for students to get quality one-on-one time with staff, that can help build self-esteem.

In fact, the Canadian Teachers' Federation's Bernie Froese-Germaine argues that education may be better off if governments focused on reducing class size -- by hiring more teachers -- rather than adding more computers to schools.

"There's a growing body of research showing that smaller class sizes, and general investment in teachers, does have a positive impact on student achievement," Froese-Germaine says.¹⁰

Holy Trinity's problem could be solved if the school board had money to build a new high school in Kanata to relieve some of the pressure, Smith-McRae says. But, due to

¹⁰Froese-Germaine 1998.

Ontario's funding policies, any new money will come at a cost. In 1998, the Ontario Ministry of Education announced it will only fund the construction of new schools if existing schools are all at 100 per cent capacity.

School closures

At 8:30 p.m. on Wednesday, April 26, 2000, Ottawa-Carleton Catholic School Board trustees and administrators rose from their chairs and joined in prayer. So did all the parents, students and teachers in the audience at Immaculata High School -- about 150 in total. They asked for guidance in making decisions about closing some schools in the district, amalgamating others, and restructuring boundaries which would force children to attend other schools.

In total, 13 schools were threatened with possible closure in 2000 or 2001. Two schools had already been closed in 1999 -- St. Raymond's Intermediate and St. Victor Elementary -- while Immaculate Heart of Mary was scheduled to close in June 2000.

The parents -- some wearing stickers with slogans like "Don't Close Elmridge" -- represented various sides of the debates. Some, like Dawn Smith-McRae of Holy Trinity, complained of overcrowding and the need for new schools. Others urged trustees to put more pressure on the ministry to provide enough funding to maintain existing schools while meeting the demand for new schools in other areas.

"We've become reliant on statistics and pre-occupied with funding formulas," argued Hal Parker, head of the school council at Elmridge Catholic School in Gloucester.⁶

Students, he said, have been reduced to numbers, while politicians talk about populations instead of communities.

"Educating children is not only a matter of the head, but the heart," he said, adding if

⁶Hal Parker, Elmridge Catholic School council chair, personal interview, 26 April 2000.

the school is closed, the 300 students currently at Elmridge would be bused to Thomas D'Arcy McGee School, about one kilometre away.

A kilometre may not sound like a long distance away, but it's far enough that many of the students would need to be bused there. And with 20 per cent of Elmridge students coming from low-income families, the extra distance may make it difficult for some students to take part in extra-curricular activities or have parents visit the school, Parker said.

Parker's words, powerful yet softly spoken, were greeted with a loud round of applause, silenced by the pounding of board chair June Flynn-Turner's gavel. Flynn-Turner had earlier threatened to have the public removed from the gymnasium if they weren't going to keep quiet.

As emotions reached the surface, it was obvious that parents were not only frustrated by the process, but they wanted to be heard. And that schools for most of them are more than a place where their children go to learn.

"There's a need for stability, continuity and support for the community's children," says Sandy VanFleet, chair of the school council at Assumption in Vanier.⁸⁸ Were Assumption to close, there would no longer be an English Catholic elementary school in Vanier.

In the end, trustees decided to close two of the schools on the list of possible closings - St. Joseph Intermediate School and St. Michael's -- but avoided closing more only through delaying half the decisions.

It's not just the English Catholic School Board that's experiencing the crunch. According to an article in *The Ottawa Citizen* the day before the public meeting, there is currently a rash of schools in Ontario, including dozens of schools under Ottawa-

⁸⁸Michael Fitzpatrick, St. George School council chair, personal interview, 26 April 2000.

Carleton's four urban school boards, facing possible closure.

The city's English public board, the Ottawa-Carleton District School Board, closed five schools in June 1999. Trustees plan to announce more school closures in November 2000. The French-Language Public School Board of Eastern Ontario is closing one school in June 2001, with another proposed to be closed in June 2001. The French-Language Central-East Catholic School Board closed nine schools in 1999, one in January 2000 and plans to close another in June 2000. Yet another school is also being considered for closure.⁶⁹

Closing schools does give boards the chance to open new schools, but while 39 schools have been closed, will be closed or have been threatened with closure since 1999, only 14 will have opened during the same time period.

There is, however, money to be saved by closing schools. If three under-utilized schools in the inner-city are closed to build one new school in the suburbs, school boards will save administrative costs from each of the three schools -- teachers will follow the students -- as well as all the subsidiary costs, including hydro, at each school.

As trustees in the Greater Victoria school district argued when deliberating their 1999-2000 budget, sometimes it may be best to cut the number of schools before slashing any further into school programs. The school district was grappling with a \$3.5- million shortfall in funding for the 1999-2000 school year, and felt a reduction in schools may be the best way to recover part of the loss. There are about 22,000 students attending Greater Victoria schools, while there is space for 28,000 students.

Still, school closures were greeted with arguments as loud as any heard in Ottawa.

On July 7, 1999, about 300 people gathered on the lawns of the legislature to deliver a singular message: their schools would not be closed without a fight.

⁶⁹Carrie Buchanan, "Living in Limbo," Ottawa Citizen 24 April 2000: D3.

"What goes on in these schools can not be marked with a price tag," said Lana Olague, a Grade 10 student at Cedar Hill Junior Secondary School who organized the protest.⁷⁰ Her words were greeted with deafening cheers by protesters -- a cross-section of society that included a large number of students, as well as some too young to attend school and others old enough to be grandparents. The majority of protesters were carrying signs, with slogans such as: "Education and Elimination," "Affordable not Portable" and "Trustees Resign."

While there were pleas to keep all four schools open, the biggest cry came those who wanted to save the inner-city Blanshard Elementary School.

Blanshard Elementary, on Kings Street across from the Blanshard Community Centre, is surrounded on all sides by housing, much of it low-income housing.

There are almost always children on the property,

shooting hoops around back or playing on equipment out front.

Perhaps that's because for many students, Blanshard is just a walk across the street or down the road.

If Blanshard was to close, Parents Advisory Council president Janet Bording says, not only would the community be centred around an empty building, children would be forced to cross some of the city's busiest streets to get to school.

Trustees in Victoria eventually scrapped the plan, gaining permission from the province to carry over the deficit for three years while finding alternative ways to save the money.

Early literacy intervention

⁷⁰Bev Wake, "Parents vow to put up fight over schools," Victoria News 9 July 1999: 3.

Mutchor Public School principal Barbara Campbell wants more money for computer software that would help the youngest children at her school learn to read. Programs like Wiggle Works, she explains, combine computer programs with books, a teacher resource manual and guides -- and can really make a difference for children.

Down the hall from Campbell's office, teacher Dorilyn Kooy-Roome has a CD-ROM version of a program called Reader Rabbit which she brought from home. She uses it with her students, because she says it helps them learn to read.

In fact, helping build literacy skills are one of the main reasons the province of Ontario is making a push to computerize classrooms, says education officer Nick Scarfo.

The same is true in other parts of the country. In Greater Victoria, three schools are taking part in a pilot project with a program called Auto Skills. Produced by the Academy of Learning in Canada, the program is designed to teach children how to read.¹

The jury is still out on how effective the programs will be. Yet there is already research which proves the effectiveness of other literacy programs -- like Reading Recovery, which has worked well for thousands of students including a six-year-old Victoria boy named Arik.²

Arik has always had trouble sitting still.

It's not that he's a "bad" kid, he just has a lot of energy. And, when he started Grade 1 in James Bay Community School in Victoria, his fidgeting increased and he became a bit more of a challenge for his teachers.

But the problem, it seems, is that while some of Arik's classmates already knew how to read a few words, Arik didn't. He didn't even recognize the letters of the alphabet.

¹Semair.

²Bev Wake, "Reading isn't as easy as ABC for some students," Victoria News 5 Dec. 1997: 5.

Two months into the Reading Recovery program, Arik still hadn't mastered the alphabet, but could already read and write. He wasn't at the level of his classmates, but he was close.

And while Arik was still slightly more overactive in class, he had shown he could concentrate, listen and learn.

Arik's father credited Reading Recovery for most of his son's improvement. It's a program Greater Victoria schools first tried in 1997, but one that has quickly been accepted.

Reading Recovery is an early intervention program, that does not involve computers, designed to help Grade 1 students who are having trouble learning to read and write. It takes six-year-olds in the school's lowest 20 per cent achievement range and provides them with individually designed and individually delivered lessons from a specially trained teacher.

The 30-minute lessons, held five times a week, involve 20 minutes of reading, 10 minutes of writing and are taught for 12 to 15 weeks outside the classroom.

Watching Arik read with his Reading Recovery teacher, Wendy Hunter, was an inspiring experience.

"Fire! Fire!" Arik said, his voice raised in mock-terror, his eyes aimed mischievously at his teacher.

"Fire! Fire!"

It's a sign, agreed the 11 teachers sitting behind a one-way mirror watching the lesson, that not only did Arik recognize the word, he understood it.

Arik struggled over the next word and, since the book was new to him, his teacher prompted him.

"What would you say if you were surrounded by fire?" she asked.

Instead of taking the easy way out -- by guessing -- Arik looked back down at the word. His small mouth struggled with the shapes of the letters he needed to string together. "Help," he said suddenly. "Help."

The word, however, took on the sound of excitement rather than terror. It was the excitement that comes with accomplishment.

Arik's father, seated among the teachers behind the mirror, looked almost as thrilled as his son.

"He's a bright boy," said Rogers Elementary School teacher Wendy Payne, who was observing the lesson. "He's one of the boys that would have been lost, and that would have been such a loss of potential."

In the United States, Reading Recovery served more than 99,000 students in 9,062 schools in 1996-97. Of those students, 83 per cent were successfully discontinued from the program as independent readers. That compares to the less than eight per cent of students in traditional learning assistance programs who ever reach the class average.

In New Zealand, where the program began 20 years ago and is now offered in 90 per cent of all schools, about 20 per cent of students take part in the program -- and more than 75 per cent of students never need special education again.

"It's a big expense initially," says Donna Harding, the Greater Victoria School District's coordinator of school services, "but there's a big long-term payoff."

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Especially, Harding says, in emotional costs. Being a poor reader affects self-esteem, and studies show people with poor literacy skills are more likely to wind up unemployed, poor and in jail.

According to the International Adult Literacy Survey, a seven-country initiative formed in 1994 to create comparable literacy profiles across national, linguistic, and cultural boundaries, about 22 per cent of adult Canadians 16 years and older fall into the lowest level of literacy.⁷⁷ These Canadians have serious difficulty dealing with printed materials, and would identify themselves as people with reading difficulties. A further 24 to 26 per cent of Canadians fall into the second lowest level, and are capable of dealing only with material that is simple and clearly laid out, and in which the tasks involved are not too complex. They can read, but not well.

Literacy, the report argues, also has a significant impact on the growth of the nation.

"Literacy is important socially, culturally, in terms of citizenship, and economically: it rewards those who are proficient and penalizes those who are not. This fact is critical to the success of Canadians and of Canada as a nation."

And if one can not read -- or not read well -- the chance of succeeding in the Information Age is also slim.

"Differences in literacy correlate strongly, almost perfectly, with educational attainment -- more education equals higher literacy," says Simon Fraser mass communication professor Donald Gutstein. "Since most jobs in the information age require higher levels of literacy, the conclusion is clear: put resources into education and literacy training. That's why the reluctance of federal and provincial governments to do

⁷⁷International Adult Literacy Survey, Reading the Future: A Portrait of Literacy in Canada (<http://www.nald.ca/nls/ials/ialsreps/high1.htm>).

just that is so troubling.”⁷⁴

As for Arik? Wendy Hunter ran into him in the library in the spring of 2000. He was checking out *Huckleberry Finn*, and now reads at the same level as other students in Grade 3.

“It’s very successful,” Hunter says of the program. “It’s incredible the gains these kids make.”⁷⁵

TOUGH CHOICES?

In a small school district in California, there’s a junior high school that’s been touted as a national model for computerized classrooms by everyone with a say on the issue in the United States, from Bill Clinton to Bill Gates.

According to a June 8, 1997 article in the *Los Angeles Times*, the school has one computer for every two students, most of whom are Latino children from low-income families. Despite the fact one-quarter of the students speak little English, test scores have risen and grades have improved since the school was computerized. School administrators are crediting computers with the change.

But the success at Blackstock Junior High has come at a cost -- 10 years and \$3 million. In addition, the school gave several teachers a year off with pay to redesign their lessons to incorporate the use of computers. Portions of the school have been rebuilt to accommodate computers, as well as a new satellite dish, video cameras and laser discs. The school now spends more than \$380,000 a year on technology -- including equipment, software and teaching training. That’s five times what the average school spends per student, and well beyond what most can afford.”⁷⁶

⁷⁴Donald Gutstein, *e.con: How the Internet Undermines Democracy* (Toronto: Stoddart Publishing Co., Ltd., 1999) 33.

⁷⁵Wendy Hunter, James Bay Community School teacher, phone interview, 4 May 2000.

⁷⁶Sandy Banks and Lucille Renwick, “Technology is still a promise, not a panacea” *Los*

A report by the Santa Monica think tank Rand Corp. reached similar conclusions about the cost of meaningful modernization, arguing that schools which do successfully integrate technology into classrooms spend up to \$450 more per student each year -- six times what the average school spends on technology and several times what they spend on textbooks."

The equivalent Canadian school may be St. Dorothy's Elementary School in Montreal. According to a series on wired classrooms which ran on CBC Radio at the end of April and beginning of May 2000, St. Dorothy's is where journalists across North America come when they want to talk about the classrooms of the future. The school's Web site (<http://www.emsb.qc.ca/stdorothy/homepage.htm>) explains how all students at the school -- from pre-kindergarten to Grade 6 -- use computers in a lab and in classrooms for project-based work. The school has a state-of-the-art Macintosh computer lab with full ISDN Internet service. The computers were bought through a combination of government funding and a \$100,000 donation by an unnamed private donor.

Most schools aren't that lucky.

Yet, without that kind of investment there is little convincing evidence that computers will be any more successful than traditional programs at helping students learn or become more successful citizens. And still, millions of dollars are being spent annually to computerize schools without such ends in mind -- while other investments that have been proven successful have been cut back.

Obviously, not every student needs extra assistance offered through programs like Reading Recovery. Not all students will need to see counsellors. Nor will students be doomed because they've taken most of their high school courses in portables or

Angeles Times 8 June 1997 A1.

"Leslie Helms. "High tech sales goals fuel reach into schools" Los Angeles Times 9 June 1997 A1.

overcrowded classrooms. Yet funding that would tackle any of these issues could make a difference to a large number of students. When it comes to health, perhaps gyms should not be transformed into computer labs, and more funding should be directed towards physical education and teachers, allowing them to return to extra-curricular activities without cutting into their own time.

As for equipment that would raise grades, despite studies that link music to academic achievement it would be foolhardy to recommend that every classroom be equipped with musical instruments and all students be required to take music classes. Music may be all around us -- and play a role in society that's particularly important in the lives of many youth -- but not everyone has a musical aptitude. Nor would everyone with an aptitude enjoy music or choose to pursue a career in music.

Can't the same, in at least a limited sense, be said about computers?

According to parent Sherry Ridout -- who complained that Victoria's schools were being forced to spend money on technology -- education decisions should involve some choices. If parents are given the option, she says, they may not agree with governments that computerizing classrooms is a priority.

"I think all parents would prioritize their personal spending to take care of their younger children's physical and emotional needs before providing their teenagers with technology, no matter how beneficial," she says. "These wonders of modern technology are after all just tools to help us to communicate and are useless unless we've first learned how to relate to others and how to critique the volume of information available today."

"Young children express themselves in non-verbal ways for the most part. Classes in music, dance and art provide them with an outlet for the thoughts and emotions for which they have not yet developed language," she says. "Studies also indicate that early childhood is the time that creativity and imagination develop. These brain processes do

not develop when a young child is sitting in front of a one-dimensional screen.”

Maybe research will eventually prove that computers can help children learn -- but although computer technology is continually evolving it's been 20 years since computers first entered schools and a wait-and-see approach can't be justified for much longer.

“After all these years I'd hoped we'd be farther ahead than we are,” says Denis Semair, Greater Victoria school district's manager of education technology, who has worked with technology and education for 30 years.

“We've had a chance to prove success,” Semair says. “We have to start justifying the expenditure of all these dollars. We have to justify spending these taxpayers' dollars.”

CHAPTER FIVE

YNN and the Commodification of Education

Modern education has been described by some as a dance floor, with business on one side and educators on the other. According to author and Canadian Teachers' Federation official Heather-jane Robertson, the partners have already crossed the floor and it's pretty clear who's leading.

Advertisers lust after our children because, even if their parents are overspent, Canadian youth control \$20 billion of discretionary spending, and develop brand loyalties that are said to last a lifetime. Promotional materials entice classroom advertisers with promises that product placement, corporate curriculum, and "partnerships" can take advantage of the captive market that only schools can deliver.¹

Adding computers to schools could cause the dance-floor music to speed up even more. A 1999 Angus Reid Group survey found 53 per cent of respondents agreed with the statement that public school boards should accept corporate donations, such as computer equipment, in exchange for allowing advertising in classrooms.

Furthermore, a 1997 national poll by Environics Research Group found that while the majority of Canadians are opposed to advertising in schools in any form, they are more willing to accept advertising when it is delivered on the computer than by other means. The survey suggests 57 per cent of Canadians oppose advertising on computers, compared with the 74 per cent of Canadians who oppose advertising on classrooms walls and 64 per cent who oppose it in hallways. The same poll suggests 75 per cent of Canadians favour closer ties to business at both the primary and secondary school levels.

Ties between business and education are not new, dating back to the 1950s. Ian Cameron discussed the trends and potential problems in a paper published in *Orbit* in

¹Heather-jane Robertson, "What are our Children Watching?" Toronto Star 8 March 1999.

1981. Cameron wrote that maps of the world used in schools were once accompanied by pictures of chocolate bars, while mining companies produced booklets on coal mining. In the past, Cameron says, there was no outcry. But even by 1980, he says, the situation had started to change as pressure groups mounted campaigns against such intrusions. The campaigns, in turn, caused companies to be more aggressive in their marketing.

"People whose livelihoods depend on those activities do more than attempt to advertise their products or actions; they try to convince the public that their undertakings are not only benign but also essential to life as we know it," Cameron wrote.²

Relationships between the private world and public schools seem to have blossomed in the 1990s. Although there are no exact figures available, the Conference Board of Canada estimates there are as many as 15,000 to 20,000 public-private partnerships in education in the country. As early as 1997, the Vancouver Board of Education's "Partners in Education" program included more than 80 businesses and government organizations, while at the Etobicoke Board of Education in Ontario, partnerships with business and the local community increased to more than 500 from 25 in 1992.³ Some of these new business relationships have nothing to do with computers. The Toronto school board, for example, signed a \$1.14-million contract with Pepsi Cola Canada to distribute Pepsi products in schools.

Computers, though, have opened up a range of opportunities for businesses. In October 1998, for example, Kellogg's launched a new program designed to reward schools with free Internet access and computer hardware. As part of Kellogg's "Education is Tops" program, students at participating elementary schools were asked to collect UPC symbols from any Kellogg's product. Schools earn 10 cents in credits for

²Ian Cameron, "Propaganda and Professionalism: Is Endorsement a Sellout?" *Orbit* 12.1, 1981: 23.

³Bernie Froese-Germain and Marita Moll, Business-education partnerships a troubling trend 1997 (<http://www.policyalternatives.ca/publications/edumon/article6.html>).

every UPC symbol collected up to a maximum of \$10,000 per school. Schools can then redeem the credits for anything they need -- including sports equipment, classroom materials or new computer systems. Schools that agree to participate in the program also receive free nutrition education resources, stickers for the students, posters, a UPC tracking sheet, and a special box in which to collect UPC symbols.⁴

Screensavers have also opened doors for advertisers hoping to capitalize on computerized classrooms. In 1997, Ontario's Peel Board of Education entered into an agreement with ScreenAd Digital Billboards Inc., which would allow the company to replace computer screensavers, which appear when computers are idle, with advertisements. The program was expected to net the Peel board \$50,000 a year,⁵ although it was eventually scrapped due to the company's business problems, says Peel School Board chair Janet McDougald.⁶ In October 1998, the Calgary public school board agreed to allow screensaver ads on some of their school computers on a trial basis. The board estimated that, if the program was expanded to all 11,000 computers in its school district, the agreement could generate about \$300,000.⁷

Screensavers aren't the only form of advertising schools have agreed to.

In June 1999, Peel District's Meadowvale Secondary School in Mississauga became the first school in Canada to sign on with the controversial Youth News Network (YNN) -- the Montreal-based organization that provides schools with technology, so long as they agree to air their privately-produced newscasts that include commercials.

⁴Kellogg's Web site (<http://www.kelloggs.ca>).

⁵"Advertisements on school computers," Toronto Star 20 Feb. 1997 (<http://www.media-awareness.ca/eng/news/news/peel.htm>).

⁶Janet McDougald, Peel District School Board chair, phone interview, 16 Nov. 1999.

⁷"Screen-saver ads in Calgary schools," Globe and Mail 14 Oct. 1998 (<http://www.media-awareness.ca/eng/news/news/two/calads.htm>).

YNN ARRIVES

The opening to YNN newscasts is obviously aimed at students. Reminiscent of the intro to the highly popular NBC drama *ER*, images flash on the screen, one after another, each lasting less than a second. The images are accompanied by a bass-driven beat, punctuated by a man's voice mechanically pronouncing the letters YNN.

Since January 2000, when the newscasts debuted on a six-month trial basis at Meadowvale, 1,780 students at that school have watched the newscasts every day. In April, they were even the subject of one of the newscasts. The story, sparked by the one-year anniversary of the high school shooting in Taber, Alberta, was designed to look at school violence from a teen point of view.

Students at Meadowvale also have a new computer lab to work in this year -- courtesy of YNN.

Owned by 51-year-old former journalist Rod MacDonald, the Youth News Network is perhaps the best-known example of a private company intent on getting involved in the public education system. Headquartered in Montreal and run through the wholly owned Canadian company Athena Educational Partners (AEP) Inc., YNN's goal is to broadcast its newscasts in more than half of Canadian high schools. The newscasts run about 14.5 minutes and include about 2.5 minutes of advertising. Participating schools are expected to air the newscasts in every classroom, on at least 80 per cent of school days, for five years.

In exchange for showing the newscasts, Athena provides the schools with up to \$200,000 worth of technology (depending on the size of the school) -- including a satellite system, VCRs and 27-inch televisions for every classroom, and 15 to 30 Pentium computers to be set up in a networked computer lab. According to Athena, the bandwidth available through the network will allow YNN to provide high-end multimedia to all of

the computer work stations, which would not otherwise be possible within the average high school. Athena will also provide training and support for teaching staff, regular maintenance on the equipment, and will upgrade the system as long as schools continue to show the newscasts.

When Meadowvale signed its agreement with YNN in June 1999 -- which included an escape clause which allow them to break the agreement six months after the newscasts debuted -- it was the first Canadian school to do so.

The outcry was immediate.

Parents and teachers' union officials, according to a June 10, 1999 article in the *Toronto Star*, weren't convinced the deal was made in students' best interests.

"I object to marketing our students as a commodity to be exploited for purely commercial reasons," said Mark Kikot, president of the Ontario Secondary School Teachers Federation Peel District.

"Parents can no longer be sure if the school has our children's best interest at heart," parent Mark Goldstein told the *Star*.

Protests echo the response YNN received when MacDonald first tried to gain access to Canadian schools in 1992, and again in 1995. On both occasions, no schools agreed to broadcast the newscasts. When YNN resurfaced again in 1998, some of the traditional critics once again spoke out against the organization, including the president of the Canadian Association for Media Education Organizations, John Pungente, who had this to say in the online magazine *Natural Life*:

YNN is the worst model of how television can be used as an education tool in the classroom. Forcing children to watch a program at specific times of day that contains paid commercial advertising in exchange for 'free' equipment turns kids into captive audiences. It turns over shrinking teaching time to advertisers' sales pitches."

"Groups Protest Compulsory Viewing of Commercial TV in Schools." Natural Life. 11

Dozens of organizations, ranging from provincial ministries of education to the Canadian Teachers' Federation to media literacy associations, have also continued their crusade against YNN.

Janet McDougald, chair of the school board in the Peel School District in which Meadowvale resides, says she was surprised by the outcry over the agreement. Businesses are already actively involved with schools in her district, she says, sponsoring breakfast programs for example.

"It wasn't controversial at all," McDougald says of the initial announcement. "It was quiet until the teachers' federations got a hold of it and said, 'No, this isn't good for public education.' Yet we have hundreds of partnerships."

YNN's MacDonald said he also had trouble understanding the protests, given the amount of equipment the school received.

"Technology is already changing the way students learn and the way that teachers teach," he said. "To deny that the private sector must play a role in managing this change is tantamount to sticking one's head in the sand."

At least some schools seem to agree with him.

By March 2000, nine other Canadian schools had signed deals with YNN, with a total of 20 schools set to air the shows by the end of the 1999-2000 school year. Of those schools, seven were in Manitoba, seven in Saskatchewan, three in Alberta and one each in Newfoundland, Quebec and Ontario.

"They're very well located. They're very spread out across the country, which is what we wanted," says Gary Pelletier, Athena's vice-president of marketing. "The program has been very well received. We've had lots of positive feedback from teachers and

Feb. 1999: 1.

"Athena Educational Partners Inc., "Students profit from classroom TV," 26 March 1999 (www.ynn.ca/press/tostar/htm).

students.”¹⁰

Making YNN profitable -- given the amount of equipment the company is handing out -- will be an expensive proposition.

But Pelletier says the company has entered into agreements with a number of companies to support its efforts, including Hewlett Packard Canada (to provide computers, servers, printers and peripherals for the computer lab), Philips Canada (which supplies televisions and VCRs), Cancom Learning Solutions (which manages the video distribution network, including the satellite link facilities), Star Choice Television (which provides satellite dishes and cable programming), and Entourage Technology Solutions (responsible for installation of the YNN infrastructure in participating schools).

Even some companies listed by YNN as “supporters,” however, appear wary of supporting initiatives that bring advertising into classrooms.

Hewlett Packard spokesperson Angela Hislop says the agreement between her company and YNN is nothing more than a vendor-customer relationship: Hewlett Packard supplies the products and Athena pays the same price for the equipment that any private, for-profit company would pay. Hislop says the company is neutral about the pros and cons of YNN.

“We’re not for or against what they do with the product,” she says. “We don’t feel as a company we can police how an organization, once they’ve bought the equipment, uses it.”

YNN, with a staff of 25 full-time employees and 65 freelancers, expects to recoup its costs primarily through newscast advertisements. YNN will not currently release its advertising rates for what Pelletier calls “competitive reasons” and due to the fact newscasts are being shown on a trial basis and advertising rates are still being

¹⁰Gary Pelletier, vice-president marketing, Athena Educational Partners Inc., phone interview, 15 Nov. 1999.

determined.

While YNN has secured advertisers such as Trident Gum and Speech Works, one corporation has already removed its ads due to negative publicity. A Rogers/AT&T commercial had been airing on newscasts until mid-March, when Rogers Communications received a phone call from a YNN viewer. Rogers public relations direction Taanta Gupta said in a March 24, 2000 e-mail interview. According to Gupta, the company's wireless division originally agreed to air the advertisements after being approached by a YNN representative who offered to put a free ad in front of a youth market.

"Unfortunately, the person who agreed to do this was unaware of the way YNN is involved in schools and did not realize the background," says Gupta.¹¹ "When we received a call a couple of days ago from someone who had seen the YNN newscast, including the Rogers AT&T ad, we spoke to our wireless division and the ad has now been pulled as it was never intended for the purpose it was used."

In addition to paid advertising, Athena hopes to recoup some of its costs through the various computer labs set up through the agreements with schools. As part of each contract, Athena is able to lease out the lab to other organizations outside of school hours on a revenue-sharing basis with the participating schools. Athena is also currently developing a model to deliver interactive media in areas of curriculum-based learning, career development and adult education. The software will be offered to schools at an annual subscription cost based on student population.

Scott Conrod, chair of Athena's National Education Advisory Council which oversees newscast content, says he doesn't see a problem with the deals between YNN and schools.

¹¹Taanta Gupta, public relations director, Rogers Communication, e-mail interview, 24 March 2000.

"If students want to work in our society, they'll have to be somewhat capable of dealing with technology," he says. "Schools are scrambling all over North America to put computers into schools... if companies are prepared to give schools money in exchange for advertising, I really don't see a big problem with it."

According to Conrod, who retired from education in 1998 after advancing to the position of CEO of the Laurenlval School District in Quebec, agreements between businesses and schools can help eliminate current discrepancies due to funding.

"There are some wide disparities," he says. "There are some schools that are so well equipped, and others where I don't think they even use overhead projectors because the lightbulbs are burned out."

Signing just 20 schools to date is still hundreds of high schools away from YNN's goal of networking 50 per cent of the high school population in Canada by June 2002, but if YNN follows the path of its forerunner in the United States the numbers may climb as expected. Launched by American Chris Whittle in 1990, Channel One now broadcasts its newscasts to about 12,000 schools in the United States, reaching 40 per cent of the high school population.

Americans schools, however, accepted Channel One in 1990. Canadians schools rejected a similar program until mid-1999. The question is: why are Canadian schools welcoming the Youth News Network today after rejecting it for the last seven years? Nothing has changed in terms of the content of the YNN broadcast since 1992 when it was first proposed. That factor suggests that the answer may lie beyond the issue of the newscast itself, and instead rest in a society that has changed over the past seven years.

Conrod doesn't hesitate at all when asked why schools are more receptive to business agreements with organizations such as YNN today than they have been in the past. His one word response? Money.

“Schools need money,” he says. “They’ve had serious cutbacks and their infrastructures are falling apart.”

Money may be part of the answer, but research suggests there are likely other factors as well -- including changes in technology, corporate expansion, changes in government policies and funding, and the pressure to meet the demands of the information age by bringing computers into the classroom. All four trends together have created a public climate increasingly accepting of privatization. If this is the case, what are the implications for schools and students? It is these questions this chapter will examine, using YNN as a case study to investigate the pros and cons of such agreements. Other examples will be pulled into the chapter, to create a broader picture of public-private agreements in education, before turning to the implications of such arrangements.

WELCOME TO THE COMPUTER AGE

Computers one-up television

Youth News Network president Rod MacDonald has been making pitches to Canadian schools since the early 1990s, promising them television equipment in return for broadcasting his newscasts. Until 1999, there was little interest in his offer. But then, MacDonald upped the ante. In addition to satellites, TVs and VCRs, MacDonald offered schools a networked computer lab with 15 to 30 Pentium computers -- depending on the size of the school -- as well as ongoing maintenance of the equipment.

YNN’s promise of computers is, perhaps, one of the most essential parts of the contract proposal they’ve presented to schools for two reasons. First, it removes the emphasis that previous agreements, and the nature of the newscast itself, had placed on television. Secondly, the new agreement ties into a pro-technology agenda, espoused by both federal and provincial governments, and a push to computerize schools.

Before computers were added to the deal, Athena's offer was very much like Channel One's in the United States. Channel One offers a satellite and a network of televisions and VCRs to schools which agree to broadcast its newscast every day. Athena brought the same offer to Canadian schools in 1992. Perhaps television just wasn't tempting enough as a technology, particularly as a teaching tool, to prompt educators to enter into agreements with businesses. As technology critic Neil Postman writes in *Conscientious Objections*, "the whole problem with the news on television comes down to this: all the words uttered in an hour of news coverage could be printed on one page of a newspaper. And the world cannot be understood in one page."¹²

There are many other notable things about television that may have discouraged educators from agreeing to show newscasts in exchange for televisions and VCRs. For example, television has been the topic of countless public debates about the possible link between television violence and violent behaviour. In addition, well-publicized studies have pointed to a correlation between increased television viewing and decreased academic performance in schools -- despite the arguments some teachers make regarding the benefits of multi-media approaches, including television, to education.

Television, like computers, had once been touted as an educational tool. When the Children's Television Network launched *Sesame Street* in 1968, for example, it was billed as a way of teaching children literacy skills. While some studies showed learning did occur, others soon emerged highlighting the negative aspects of *Sesame Street*: "the passivity, the simplicity, the stifling of imagination, the behavior modification, the shortened attention span, the training to be an avid consumer, and the distortions that characterize all learning from television."¹³

¹²Neil Postman, Conscientious Objections: Stirring Up Trouble about Language, Technology and Education (New York: Alfred A. Knopf, Inc., 1988) 72.

¹³Frank Mankiewicz and Joel Swerdlow, Remote Control: Television and the Manipulation of American Life (New York: Ballantine Books, 1978) 237.

According to educators, because television is a passive medium it does not encourage children to figure things out for themselves. Instead, students learn that there is a right answer to every question and that someone will always give them the right answer, usually in an entertaining way.¹⁴ The nature of television, educators argue, may hinder the development of critical thinking skills teachers hope to instill in students.

Still, people like Chris Whittle and Rod MacDonald who were promoting the use of television in schools throughout the 1990s argued that students liked television -- and because of this, would likely learn from television. In discussing Channel One, writer Sven Birkerts had this to say about Whittle's motive for offering televisions to schools: "The underlying premise is staggeringly simple: if electronic media are the one thing that the young are at ease with, why not exploit the fact? Why not stop bucking television and use it instead, with corporate America picking up the tab in exchange for a few minutes of valuable airtime for commercials."¹⁵

The proposal may have worked in America, but perhaps Canadians were not quite as willing to hold up television as the good they received in exchange for allowing the corporate world into the classroom. When it comes to computers, however, schools can hold up a product that even governments are promoting as an educational aid that could form the foundation for education in the new millennium.

Corporations eye lucrative student market

While researchers have investigated links between television and violence and video games and violence, computers have by and large escaped criticism, instead being viewed

¹⁴Mankiewicz & Swerdlow 234.

¹⁵Sven Birkerts, The Gutenberg Elegies: The Fate of Reading in an Electronic Age (New York: Ballantine Books, 1994) 124.

as a positive learning tool. Researchers who do look at negative aspects of computers, such as access to pornography, shoot-em-up games and tips on how to make bombs, tend to look at these incidents as aberrations. To access such inappropriate material, one must request it, unlike on television where any child with cable can inadvertently access murders and beatings with an innocent click of the remote control.

Changing technology, however, is just one explanation of why schools are increasingly willing to arrange deals with corporations in order to modernize. Corporations must also be willing to step into schools -- and the fact that corporate interests have turned their eyes to schools doesn't come as a surprise to political economy theorists like Vincent Mosco.

In his book *The Pay-per Society: Computers and Communication in the Information Age*, Mosco argues that western society is experiencing a "deepening and extending capitalism."¹⁶ During this process, Mosco writes, formerly untapped segments of society, like schools, are transformed into markets.

One cannot rule out the possibility that some corporations may be acting benevolently, making donations to schools out of a desire to improve the education system. Undoubtedly, business people also have children in the education system. The political economy perspective which influences Mosco's writing, however, requires a certain wariness when looking at corporate interests, since it suggests corporations are always interested in extending their market, and schools have until recently been an untapped market -- and a lucrative one.

Businesses like YNN and Channel One are for-profit enterprises, specifically targeting schools. Channel One, for example, collects up to \$200,000 US per advertisement aired

¹⁶Vincent Mosco, *The Pay-per Society: Computers and Communication in the Information Age. Essays in Critical Theory and Public Policy* (Toronto: Garamond Press, 1989) 25.

on its newscasts to students.¹⁷ The market is so lucrative that by October 1989, almost six months before Channel One's 1990 launch:

Whittle had sold more than \$149 million worth of commercials in three- and four-year contracts, with \$51 million for 1990 -- more than half the launch revenue projections . . . to put these figures in competitive "news" perspective, the ESPN television network sold only \$10 million worth of commercials in its first year, and Turner's CNN network only \$24 million.¹⁸

According to statistics packaged by the Media Awareness Network, children absorb ads. A 1998 U.S. study of 9,600 children aged six to 17 found youth were able to identify 240 commercials without prompting. Statistics suggest that in the United States, parents give their children about \$6 billion in allowances each year, while youth also influence what their parents buy to a total of \$50 billion each year. According to Statistics Canada, Canadian children spend about \$1.5 billion each year and influence how an additional \$15 billion is spent.¹⁹

Erika Shaker, a researcher with the Canadian Centre for Policy Alternatives, has argued that education is so lucrative it has evolved into an industry in its own right.

We cannot afford to concentrate on isolated examples of private sector involvement in public education. To fully comprehend the enormous resources and effort behind this movement, we must look at the "big picture," or what has come to be known as *the Education Industry*, representing over (US)\$600 billion in the United States and approximately (US)\$60 billion in Canada.²⁰

Shaker argues that education is one of Canada's largest economic sectors, and as such is seen as an investment market by corporations and an expensive undertaking by

¹⁷Ann Marie Barry, "Advertising and Channel One: Controversial partnership of business and education," Watching Channel One: The convergence of students, technology, and private business, ed. Ann De Vaney (New York: State University of New York Press, 1994) 125.

¹⁸Barry 108.

¹⁹Erika Shaker, The CCPA Education Project: Learning about the Commercialization of Education 1998 (<http://www.policyalternatives.ca/publications/edumon/article10.html>).

²⁰Shaker 1998.

governments. The government could rid itself of some of its educational expenses. Shaker says, by offloading the costs on to corporations willing to pick up the tab in exchange for a market.

Technological corporations, on the other hand, tout their involvement with education as being good for society and the economy -- an argument that's easily accepted in a social climate in which technology has come to be viewed as the saviour of a distressed education system.

In discussing Microsoft's role in education, company president and former CEO Bill Gates had this to say to an audience at the New York Institute of Technology last year:

If we look at schools, we're going to have to play the primary role in getting this technology out to kids. Some of the statistics give us hope that we can really fulfill this mission. 90 percent of schools have some type of Internet access. Now, what that means varies quite widely. In some cases, that means a single computer -- if you had to wait in line, you'd get very impatient for an individual student to actually have a chance to go out there, and really browse the Internet ... Our goal should be that this Internet access should not just be in a lab somewhere, but it should be literally in every classroom. It should be part of the curriculum, and getting teachers enthused about bringing this in as a new tool.²¹

Sounds fine, and Gates might honestly believe technology and Internet access will improve education. Microsoft is, after all, a key sponsor of Industry Canada's SchoolNet program.

Regardless of Gates's motives, however, his company stands to profit from such an expansion. Microsoft will, undoubtedly, want its products in schools. As Heather-jane Robertson, director of professional services for the Canadian Teachers' Federation, writes in her book *No More Teachers, No More Books*, "the demand for personal computers (PCs) in the private sector is shrinking -- increasingly it's limited to the upgrading of existing systems -- and most businesses have met, or exceeded, their IT needs.

²¹Bill Gates, "Public Address to the New York Institute of Technology" 1999 (<http://www.microsoft.com/billgates/speeches/10-28GenI.htm>).

Consequently, the education technology market is becoming more important.”²²

Then there’s the software that will need to be purchased for the computers to be useful, another added cost for schools and another sale for companies like Microsoft. Current financial rewards don’t even take into account potential long-term benefits in the form of future markets. If children are reared on Microsoft and familiar with that product, then they’ll likely buy Microsoft products when they’re adults ready to buy a computer of their own.

In his book *e.con: How the Internet Undermines Democracy*, Simon Fraser University communications professor Donald Gutstein outlines the opportunities for businesses like Microsoft in the field of education. Under the “Microsoft Institute” (which later became known as Anytime, Anywhere Learning), people can register for kindergarten to Grade 12 courses through a computer link-up through a school’s computer centre, library or home. Education departments at participating schools approve the content, while students pay a fee for the course and are able to use the school’s resources. To take the course, however, all participants must have access to a laptop computer that runs Windows ‘95.

The New Brunswick government agreed to link all public schools to the network when it was launched. The program allows the province’s schools to connect to education resources around the world, while users around the world have the same access to New Brunswick’s educational resources. As Gutstein explains, because Microsoft is offering the program throughout the world, it can offer software packages at subsidized prices since the cost of reproducing software is nearly zero. As a result, few students will likely pay full price to buy software from Microsoft competitors like Corel, which in turn may encourage businesses to use Microsoft products that students will be more familiar with.²³

²²Heather-jane Robertson, *No More Teachers. No More Books* (Toronto: McLelland & Stewart Inc., 1998) 126.

²³Donald Gutstein, *e.con: How the Internet Undermines Democracy* (Toronto: Stoddart Publishing Co. Ltd., 1999) 223.

Governments promote business partnerships

The British Columbia and New Brunswick governments have both urged their school boards not to sign agreements with the Youth News Network. In a speech to the B.C. Teachers' Federation on March 17, 1999, then B.C. Education Minister Paul Ramsey told teachers that YNN "is not acceptable to me, and is not what I would consider to be a legitimate use of instructional time. I've instructed my deputy to send a letter to all superintendents, letting them know that YNN is not welcome in B.C. classrooms."

No B.C. school has signed up with YNN to date, but according to ministry spokesperson Maria Lironi, the government has stopped short of forbidding school boards from entering into agreements with the organization.²⁴ If the government was to adopt such a policy, the issue would be moot, as government policy determines what can or cannot occur within the education system.

Canadian policies, as they currently stand, may actually encourage schools to enter into ties with businesses.

While in the past, governments have accepted if not condoned advertising in schools, more recently that acceptance has turned into policy. For example, chapter seven of the online version of *Preparing Canada for a Digital World*, the final report of the federal government's Information Highway Advisory Council, states:

While noting that responsibility for education lies with provincial and territorial governments, the federal government committed itself to facilitating and fostering cooperation among the various stakeholders -- including governments, learning institutions, sectoral councils, the private sector, business associations, labour organizations, associations for learning technology professionals, women's groups, community groups and other non-governmental organizations.²⁵

²⁴Maria Lironi, British Columbia Ministry of Education media relations officer, phone interview, 30 Nov. 1999.

²⁵Canada, Industry Canada, Preparing Canada for a Digital World: Final report of the Information Highway Advisory Council (<http://www.schoolnet.ca/home/e/info/mission/html>), 1997

Not only have governments encouraged the education sector to co-operate with business associations and the private sector, they've also attached funding to the policy. As early as 1996, for example, Ontario Education Minister John Snobelen announced \$20 million in funding for the second stage of the Technology Incentive Partnership Program, which "asks school boards to come together with the private sector to come up with exciting projects" to be posted online.²⁶ Is there an easier way to ensure your school can compete for this type of funding, than by signing a deal with an organization like YNN that would provide your school with a computer lab of up to 30 computers?

Government funding policies also send a message to school boards. As discussed in *Chapter Four*, there is debate about exactly how much money has been invested in technology at the federal and provincial levels, but one source suggests the federal government has spent about \$52 million²⁷ on the SchoolNet program alone. The objectives of the program are to:

stimulate learning and produce a school graduate population with a strong command of information and telecommunication technologies, which are key employability skills in the new global knowledge-based economy; enhance educational opportunities and achievements in schools across Canada by making national and international resources available to learners and educators, regardless of geographical locations.²⁸

Computers and the Internet, indeed, are presented as powerful educational tools which will benefit the economy and enhance not only education but educational opportunity.

The federal government has not limited its promotion of computers as key to a successful education system. It has also touted the broader Connecting Canadians

²⁶Ontario, Ministry of Education, Minister Announces New Stage in Expanding Technology in Education (<http://www.edu.gov.on.ca/eng/document/nr/96.10/tippl.html>) 4 Oct. 1996.

²⁷Gutstein 213.

²⁸Canada, Industry Canada, What is School Net? (<http://www.schoolnet.ca/home/e/info/mission/html>).

program, which will provide all Canadians with access to the Internet through computers at various community centres, as central to a healthy economy.

Provincial mission statements are comparable to the federal initiative. They also promote the benefits of building a society to meet the needs of the information age. The first mandate of New Brunswick's Information Highway Secretariat, for example, is "to create a society in which citizens are both technically and psychologically predisposed to the information highway."²⁹ In such an environment, then, any offer of tools such as computers that would aid in this transition are more likely to be justified. As Heather-jane Robertson writes, "any enterprise that emphasizes technology for kids is in the right business at the right time."³⁰

Government cutbacks and spending decisions

In order for public-private partnerships such as YNN to appeal to schools, another factor comes into play: funding. In the United States, inadequate funding has been cited as the main reason schools agreed to deals with Channel One. According to a U.S. study,

thirty-nine percent of superintendents cited educational value, curriculum enhancement, or a solution to geographic isolation as a key factor that influenced the decision to try Channel One. However, 57 percent cited the opportunity to get equipment during times of little money as the most influential factor in contracting for the broadcast.³¹

According to John McEwen, chair of the education finance committee of the Ontario Secondary School Teachers' Federation, Canada is in a similar situation today, despite the perception that Canada has a better-funded public education system than the U.S.

²⁹New Brunswick, Our Vision 1995 (<http://www.edu.gov.nb.ca/edt/infhigh/mandate.htm>).

³⁰Robertson, No More Teachers 241.

³¹Nancy Nelson Knupfer, "Channel One: Reactions of Students, Teachers, and Parents." Watching Channel One: The Convergence of Students, Technology, and Private Business ed. Ann de Vaney (New York State: State University Press of New York, 1994) 65.

As Simon Fraser University mass communication professor Donald Gutstein outlines in his 1999 book *e.con: How the Internet Undermines Democracy*, the Ontario government has cut \$1.5 billion from education since 1995. “spooking Canadians into favouring closer ties between education and business.”¹²

Such cuts set the stage for businesses to step in and help the troubled school systems, according to the Canadian Teachers’ Federation’s Heather-jane Robertson. She says this creates an absurd situation in which we are asking “the very organizations that have clamored for lower taxes and less public spending to rescue the schools that these policies are damaging.”¹³

Even as education budgets have been cut, however, governments across the country have made money available for technology, reflecting what some critics have called a pro-technology agenda. This kind of choice in spending does send a message to the education community about government priorities.

The investments go beyond wiring classrooms to the Internet. On March 27, 1997, Snobelen announced a \$60-million investment in new technology for students in early grades.¹⁴ On March 26, 1999, Prime Minister Jean Chrétien announced a \$15-million investment in on-line classroom projects to be developed by Canadian teachers and students through Canada’s SchoolNet GrassRoots program. Chrétien challenged the private sector to match the donation, and Clearnet, Stentor and Microsoft Canada answered his call.¹⁵ Here, one can see the relationship between cuts to education, calls for

¹²Gutstein 200.

¹³Robertson, No More Teachers 285.

¹⁴Ontario, Ministry of Education, Minister Announces Fund of \$60 million for New Technology in Classrooms (<http://www.edu.gov.on.ca/eng/document/nr/97.03/tipp2e.html>) 27 March 1999.

¹⁵Canada, Industry Canada, Prime Minister Announces \$15 Million for on-line Classroom Projects Under Connecting Canadians Strategy 26 March 1999 (<http://www.ic.gc.ca/cmb/welcomeic/nsf/558d636590992942852564880052155b/85256613004azel7852567400069e335?OpenDocument>)

business support, and a technological agenda.

"GrassRoots will contribute significantly to fulfilling our vision of making Canada the most connected nation in the world by the year 2000, and helping Canadians become the most sophisticated users of this new technology." Industry Minister John Manley said on Oct. 15, 1998. "We are pleased to be able to work with a partner like Microsoft that shares our vision of preparing our young people to meet the demands of the knowledge-based economy."

However, donations that are targeted in such specific ways beg the question: while clearly some resources do need to be spent on educational technology, should such a high priority be placed on technology in the face of drastic cuts to education funding and the interface with business in the wake of this?

Society embraces the Information Age

Technological changes, corporate expansion and government policies could be fought -- if the public wanted to fight them.

But the outcry against private-public partnerships in schools has been fairly limited, perhaps reflecting support for such agreements. As indicated earlier, polls show that between half to three-quarters of Canadians favour closer ties between schools and business.

According to political economists like Vincent Mosco and Andrew Reddick, however, political and economic interests often "interact in a hegemonic way to frame the agenda, prescribe the policy alternatives, and gain general social acceptance and institutional standing, even in the face of contradictions that give rise to opposition by social interests both during and after policy change."¹⁰ Mosco and Reddick define

¹⁰Vincent Mosco and Andrew Reddick, "Political Economy, Communication, and Policy," Democratizing Communication?: Comparative Perspectives on Information and

hegemony, or social norms, as:

what comes to be incorporated and uncontested as the taken-for-granted, common-sense, natural way of thinking about the world, including everything from cosmology through ethics to everyday social practices. Hegemony is a lived network of meanings and values, which, as they are experienced in practice, appear as mutually confirming and natural.”¹

In Canada, a belief in the benefits of universal health care has become a norm, something that is valued and in a sense comes to define the values of the nation. Although this norm has come under attack recently, by proponents of a two-tiered health-care system, most Canadians favour a health-care system that considers all Canadians equal regardless of economic status.

In a similar way, public education has traditionally been considered one of these norms, a norm that is evolving due to changing government policies, evolving corporate goals and a society driven by the information age. Cuts to education and investment in technology, for example, help perpetuate the belief that the education system is in trouble and technology is the best way to save it.

As Lillooet Secondary School teacher Paul Belland says, “the public has been sold a bill of goods saying your kids need technology.”

In order to get this technology, during a time of fiscal belt tightening, schools are increasingly willing to enter into agreements with private companies.

Carleton University public administration professor Robin Farquhar says education is still worshipped as a public good in Canada -- but not to the extent it used to be.

“Some of that has been given up because the government at both the federal and provincial level have discovered they have economic problems,” Farquhar says.

But private involvement in public education is not a trend Farquhar finds particularly

¹Power eds. M. Bailie and D. Winseck (Cresskill, NJ: Hampton, 1997) 21.

²Mosco and Reddick 27.

troubling.

In fact, provided that educators have the ability to say Yes or No to any proposal and academic values aren't sacrificed, Farquhar says schools should get as much as they can out of the private sector.

"I don't see it, by definition, that corporations are bad. I just don't believe it."

Other people aren't as optimistic.

Joanne Naiman, a professor of sociology at Ryerson Polytechnic University in Toronto and a member of People for Education, says current changes to the public education system could turn education into a competitive marketplace that will create a two-tiered system.

"As with all free-market "choice," the advantages go to those who have the most resources to purchase goods in the market," she says. "In other words, not all parents have equal access to educational choice. For example, some parents cannot get time off work to line up for a popular school or program, while others cannot drive children to schools outside their area. In the end, the growth of the free market model of education creates winning and losing students, and winning and losing schools."¹⁸

Farquhar, however, doesn't believe the current trend towards private-public partnerships in education heralds the end of the public school system. There has been no huge increase in the number of private schools in Canada nor a huge exodus of students to existing private schools, which could be seen as predictors to change.

"I just don't see governments getting out of the business," he says.

THE YNN DEBATE

"Joanne Naiman, "A Parent's Guide to publicly-funded education: Schools can't do their job if shifted to a market model," CCPA Education Monitor Vol 9, No. 3, 1997 (<http://www.policyalternatives.ca/publications/edumon/article24.html>).

Debates about the introduction of private companies and advertising into schools aside, there is little theoretically wrong with many corporate proposals: corporations are offering products they believe will assist the educational process.

YNN, in many ways, is no exception. One of the company's goals is to improve equity. This desire to provide equal access to education to students throughout the country has been espoused by YNN officials, as well as its sponsors, including the president of BKM Research and Development Beverley MacIntyre. Speaking on an Athena promotional video, MacIntyre said:

I really want to be able to take out education to people no matter where they're at, and not to the ones that can sit down with the great big multi-media machines and screens. They're not the ones that really need help. They're going to get it. They're going to survive. But we want to be able to bring it... way up to northern New Brunswick and the little island I grew up on, and to the people who can't afford those big machines."³⁹

Heather-jane Robertson says that by emphasizing YNN's potential to increase access to technologies, the company will strike a chord with parents and educators.

"Public education is aligned with the pursuit of equity because a shared public commitment to achieving greater equity is the only reason for public schools to exist," she says. "Anything that undermines this goal will be opposed by those who care about schools; conversely, innovations that promise to advance equity will attract support."⁴⁰

Athena's offer will allow schools to take advantage of investments like SchoolNet by providing high-quality computer equipment and bandwidth at no cost -- provided, of course, that the schools agree to broadcast the YNN newscasts.

Athena's biggest selling point, free multi-media equipment aside, is its stated goal of improving student knowledge of current events, says advisory board chair Scott Conrod.

³⁹Athena Education Partners (AEP) Inc. (Producer) YNN Video Brochure [Videotape] 1999.

⁴⁰Robertson, No More Teachers 189.

Research suggests that more than 90 per cent of teenagers do not watch news programs or read newspapers, he says, and therefore have little knowledge about current events. The expressed goals of YNN, outlined on Athena's Web site, are an attempt to address what it sees as a lack of interest in news, and in doing so create more informed and active citizens.

YNN's goal is to promote a greater awareness of news and current affairs among Canadian high school students by making daily news and current affairs more relevant, interesting and accessible. By focusing on the relationship between national and global events and their daily lives, we believe that YNN can help young adults make better informed decisions . . . YNN aims to encourage our youth to play an active role in shaping their future through a greater understanding of national and global events.

It is for those reasons, Janet McDougald says, that Meadowvale Secondary School in Mississauga decided to sign on with YNN.

"We don't see YNN as a requirement because we're short of money," says McDougald, chair of the Peel District School Board in which Meadowvale is located. Instead, McDougald says, the district sees YNN as a tool to heighten student awareness of current events and as a resource for teachers

According to those involved with the YNN project, there is evidence to suggest that students who watch YNN are more aware of current events than those students who don't. In 1992-93, YNN ran newscasts at a Montreal high school during a six-week trial period. Apart from the fact the school received no equipment in exchange for agreeing to air the broadcast, the broadcasts were the same as those currently being aired at Canadian schools.

"We found that the students were more aware of current events because of the experience, and were more willing to talk about current affairs with their social studies teachers," Conrod says.

YNN also promises to give Canadian students an opportunity to compile their own

news stories. Through YNN, students from throughout the country will have the chance to produce regular segments for the news program, says YNN's Gary Pelletier. Students who choose to participate will receive training, as well as support from field producers, camera operators, editors and other trained YNN staff. Again, Pelletier says such plans are expected to fully take hold once the pilot projects end.

Because no studies have yet been completed on the impact of YNN in Canadian classrooms, any conclusions about its ability to improve knowledge of current events would be speculative at best. However, the University of Toronto's Ontario Institute for Studies in Education is tracking the effects YNN has on students at Meadowvale secondary school. The results, to be released after the six-month trial period ends in June, should shed better light on the situation.

McDougald says her school district's research department is also evaluating the YNN experience, through journals, surveys and polls of all stakeholders, including parents, staff, students and concerned outside groups. In addition, the board safeguarded its interest by negotiating a pilot contract that will allow the school to stay in or opt out after the six-month trial. If it decides to keep the program, the contract will run for five years.

"We will authentically evaluate what's being shown," McDougald says. "I believe the interests of students have been safeguarded."

Conrod says YNN will listen to any concerns.

"If we are not responsive to complaints and concerns, the thing will die and drop out," he says.

Conrod, however, says the Educational Advisory Council he chairs for Athena will help ensure children's interests are protected. The council, set up as an independent, self-governing body of educators and parents, must review and approve all sponsored programming before it airs on YNN. Conrod says the council will apply stricter

guidelines than those of the Canadian Code of Advertising.

"It is important for our young people to harness an awareness of current events and technology skills in this knowledge-based society," Conrod says. "At the same time we have to be responsive to legitimate community concerns about advertising in schools."

Because the newscasts will be put together by professional journalists, Conrod says news content will also meet professional standards.

Until the YNN studies are complete, however, possible theories about the potential effects YNN may have on students could be developed by looking at the impact Channel One has had on American schools. Studies about the effectiveness of Channel One in increasing students' knowledge about public issues are varied. Some research suggests Channel One does have a positive effect; others suggests the opposite.

One statistical study, based on phone interviews with school superintendents in a southwestern state, and two surveys of a sampling of students, teachers and parents in three school districts in the same state, suggests that after nine months of watching Channel One broadcasts students believed they were more informed about current events, cultural literacy and geography.⁴¹ Furthermore, the study also suggests a slight increase over the nine-month period in the percentage of students who read news magazines and watched TV newscasts at least three times a week.⁴² By the end of the nine-month period, a clear majority of parents, teachers and students agreed that their schools should continue to receive the program.⁴³

Another report -- which followed a seven-month case study -- argued that Channel One newscasts had little educational benefits because they did not tie into curriculum and

⁴¹Nancy Nelson Knupfer, "Channel One: Reactions of Students, Teachers and Parents," Watching Channel One: The Convergence of Students, Technology, and Private Business ed. Ann De Vaney (New York: State University of New York Press, 1994) 71.

⁴²Knupfer 79-80.

⁴³Knupfer 85.

were usually presented with little introduction or follow-up.⁴⁴ Because of this, the study concluded that students who watch Channel One may develop a false sense of confidence about their awareness of current events.

"The effect that watching seemed to be having was to say to kids that watching this TV was more important than studying, and that, if they watched this -- commercials and all -- they had seen and heard enough news for the day and did not need to spend more time on current events," concluded researcher Rhonda Robinson.⁴⁵

The most realistic conclusion, perhaps, is best summed up by Nancy Neilson Knupfer and Peter Hayes in their comprehensive study, "The Effects of the Channel One Broadcast on Students' Knowledge of Current Events." Using MANOVA data to analyze test scores on current events tests, Knupfer and Hayes found no significant difference in test scores between those who received Channel One broadcasts and those who did not.⁴⁶ The researchers concluded that "Channel One does not appear to be an aid nor a hindrance to learning, but simply ineffective in terms of its claims."⁴⁷

Knupfer and Hayes also found, however, that students did remember the advertisements.

If not a hindrance to learning, then, perhaps the best way to analyze the merits of the newscasts is to look at the information they deliver. As some theorists suggest, however, there are implicit problems with business exchanges that involve information. This is due to the fact that information is not a commodity in the traditional, economic sense.

⁴⁴Rhonda S. Robinson, "Investigating Channel One: A Case Study Report," Watching Channel One: The Convergence of Students, Technology, and Private Business ed. Ann De Vaney (New York: State University of New York Press, 1994).

⁴⁵Robinson 30.

⁴⁶Nancy Nelson Knupfer and Peter Hayes, "The Effects of The Channel One Broadcast on Students' Knowledge of Current Events," Watching Channel One: The Convergence of Students, Technology, and Private Business ed. Ann De Vaney (New York: State University of New York Press, 1994) 51.

⁴⁷Knupfer and Hayes 58.

In the economics model, buyer and seller exert no influence on one another. They are assumed to be autonomous "others," rationally engaging in activities to maximize their individual welfare. By contrast, the communication system at a minimum posits influence by the sender on the receiver. . .⁴⁸

Following this theory, then, any meaningful discussion of the information schools receive from YNN needs to include a discussion of the influence possibly being exerted by the sender.

Carleton University mass communication professor Vincent Mosco, in *The Pay-per Society*, further expands on the ability of organizations to exert power over audiences -- through what he calls mobilization.

The past century has seen an accelerating use of communication and information technology to build mass audiences of consumers for information, entertainment, and, more significantly, for the products advertised to support information and entertainment programming... Essentially, advertising promotes what Gaudemar calls the process of mobilization. People are mobilized for the purpose of packaging their attention for sale to advertisers (commodification) and for socializing them into particular sets of acceptable values (social control).⁴⁹

If Mosco's theory was applied to schools, it would suggest students are being sold to advertisers, who in turn can exert social control over them by socializing them into a set of pre-determined values.

YNN: How much influence could it have?

The Youth News Network contract for Meadowvale Secondary School sets out the responsibilities of Athena, the Peel school district and the school. Among the school's requirements is that the newscast must be shown on at least 80 per cent of the days it is transmitted over a five-year period. Teachers aren't required to make sure students are devoting all their attention to the newscasts, but the board must let Athena know when

⁴⁸Robert Babe, "The Place of Information in Economics," Communication and the Transformation of Economics (Boulder, CO: Westview, 1995) 41.

⁴⁹Mosco 31.

asked how many, if any, students have refused to watch the newscast. If a school breaks the contract, the equipment will be removed.

YNN should have no problem determining violations because, as explained in the contract, an "automated audit program" has been installed in the program to collect information about the showing of newscasts, including the time of day the program is shown to students, the length of the program shown to students, and the volume level the program is shown at. In this respect, it would be difficult for any teacher, in principle, to violate the agreement or even turn down the volume for the ads.

As YNN has been airing newscasts for only a few months, there is little material to analyze in terms of trends in editorial content. A viewing of YNN's sample newscast, however, does offer evidence of the potential to transmit a biased message. The sample newscast is seen as significant, as this is the newscast the organization submitted to schools and advertisers to show the merits of the program.

The sample newscast's lead story on the 1998 Quebec election includes interviews of seven students on the issue of Quebec politics and separatism. Not one student, including two from Quebec, expressed separatist statements. Six of the seven students demonstrated a federalist attitude, while one was neutral -- an unlikely depiction of the actual climate in Quebec. The selection of students, perhaps, reflects the political bias of some staff within the organization, including Scott Conrod, the chair of the advisory council set up to ensure the newscast meets high standards. Conrod openly admits he is against the "Balkanization" of Canada.

The second story on YNN's newscast also reflects a bias, while at the same time reinforcing the notions of a consumerist culture. A reporter discussing the sinking Canadian dollar explains the significance of the rate of exchange to students by saying "we shop." Last year, she explained, students may have been able to afford to buy roller

blades while this year they are just too expensive. This narrative effectively promotes consumerism -- especially since it is book-ended by commercials. All of the messages are given added legitimacy by the fact they are being shown in schools.

Further into the YNN sample newscast story on the low dollar, the reporter interviewed a professor at Concordia, the only source in the story. The professor explained that the dollar is low because of the Asian crisis, but more importantly because Canada has a very high debt level due to the fact it borrowed heavily to pay for social programs. This debt, she further explained, is being repaid in the form of higher taxes. The message in this news story is as obvious as the federalist message in the first: the debt is equated to social programs, social programs which the government has cut over the past decade to chop into the debt.

This story, however, avoided any mention of opposing views about Canada's low dollar or the benefits of social programs. High taxes are written off as "bad," despite the fact citizens may choose to pay taxes to preserve social programs. In November 1999, for example, New Zealand citizens elected a new prime minister based on her promise to raise taxes to improve social programs.

An analysis of later newscasts, which are being shown at Meadowvale and other participating schools, are more promising as they don't exhibit the same trends. Issues covered in a week's worth of newscasts in mid-March ranged from racism in Saskatoon, to gun control, to suburban prostitution and anger management. In some cases the issues were addressed in a way that would give students more information than would usually be available on regular newscasts. On March 14, for example, the YNN newscast tackled the subjects of anorexia and bulimia. The coverage lasted about seven minutes, broken up by advertisements, an interactive news quiz and a short story on Toronto Maple Leafs player Brian Berard who was blinded by a high-stick from the Ottawa Senators' Marian

Hossa in a National Hockey League game.

The first component of the main story on anorexia and bulimia looked at a young woman with an eating disorder, while the second segment focused on a young man with anorexia. The stories provided much more information than would be offered in a typical television newscast which would last about 1:30, while YNN's focus on a male anorexic was unusual and informative. The newscast also offered Web site addresses which could help students who were suffering from an eating disorder.

The March 14 newscast was professionally packaged and comprehensive, but not all stories in other newscasts were so compelling. A March 13 news story on racism in Saskatoon, for example, was covered by a young woman whom the news readers described as new to the YNN staff. Her inexperience was obvious -- and this may be a recurring problem, given YNN's youthful reporters and high school freelancers. While the visuals were very strong, the voicing of the story was weak, and the story was incomplete. In part, it focused on racist attitudes of Saskatoon police -- yet the reporter claimed neither the RCMP nor the police were available for comment. Such a one-sided story would not likely have aired on mainstream television news or, if it did, would have at least included comments from police saying they were not available for comment.

Later in the March 13 newscast, the news readers discussed the demise of the federal government loan program, and how banks were no longer willing to give money to students who were increasingly unable to pay it back. The news reader, however, determined bank participation didn't matter, because the government has promised it won't let students down, even if it means funding the loan program itself. How would it do this? "They might get money from the private sector and maybe even from American companies," the news readers reported. While the newscast doesn't go on to discuss the pros and cons of corporate involvement in education, the news readers' discussions did

segue into an recent agreement between McGill University in Montreal and Coca-Cola, which gives Coke exclusive distribution rights at the school. McGill students, YNN reported, voted against the deal. The coverage fairly mentioned both sides of the debate, while not choosing one side or the other.

An analysis of YNN newscasts to date, it seems then, would be inconclusive. With so few produced so far, it would also be difficult to form any conclusions about YNN's long-term ability to shape opinions.

That's not the case with Channel One, which has been broadcasting in the U.S. since 1992. The organization, while not aligned with YNN, provides an interesting glimpse into what YNN could eventually offer students. The two organizations are frequently compared and have adopted a similar style. Both newscasts are aimed at a teenage audience, and both organizations express a desire to provide news in an entertaining fashion. Both YNN and Channel One make their newscasts available online, to be downloaded by anyone to view. The newscasts are the same as those that air in classrooms, minus the advertisements.

Selected at random, Channel One's Nov. 8, 1999 broadcast offered an interesting glimpse into the type of news these teen-directed organizations deliver to students. The broadcast covered two stories in depth: the top item was about the court ruling which declared Microsoft a monopoly, while the second story was about the U.S. unemployment rate, which at 4.1 per cent was at its lowest rate since 1970. The selection of these stories was certainly fair by journalistic standards: both were newsworthy and important. The coverage would also be well-suited to a teenage audience. Even to students raised on television, the newscast would likely be considered entertaining. More importantly, however, the news stories explained the issues without being condescending. For example, the first report defined monopoly and put it into context by explaining that

nine out of 10 computers used the Windows operating system. In contrast to mainstream media coverage, the report also included opinions from youth -- two boys, aged 14 and 16. The second story, which lasted three minutes and twenty seconds, was similarly constructed. The reporter, for example, defined both unemployment and inflation in easy-to-understand ways.

The first story, on the Microsoft monopoly, began with the following introduction: "Now, 25 years ago your school was lucky if it had a computer. Now, computers are an important part of education and the driving force behind the information age economy that's created hundreds of thousands of jobs." This introduction reflects a pro-technology bias running counter to the likes of Heather-jane Robertson and Neil Postman, who oppose computers in the classroom. After telling students how "lucky" they are to have computers in their classrooms, the reporter emphasizes the fact by explaining computers are the driving force of the information age which is leading to an unbelievable number of jobs. This, in turn, implies that the purpose of schools is to get students ready for the workforce. Again, there are critics who would argue schools would do better if they concentrated on helping students become responsible, confident, informed citizens.

The newscast's second story, on unemployment, also has a bias which can best be illustrated by its explanation of the significance of low unemployment rates. The reporter explains it as such: more jobs mean more people making money; with more people making money, more money will be spent; that money is used to buy goods and services; right now, companies are doing a good job keeping up with demands for their goods and services; that keeps prices at a reasonable level which ultimately keeps the job market strong; all those workers are paying taxes, and that tax revenue may pay off some of the debt. The message of the story is clear: students should get a job and spend their money, because doing so will keep prices low and keep the economy strong.

The Nov. 8 newscast may reflect a general bias at Channel One, according to the work of researcher John C. Belland. In "Is This the News?," Belland analyzed a week's worth of Channel One feature stories, three of which focused specifically on technology, and found:

Nowhere in this series of feature stories on technology were there any concerns expressed for the male-gendered hegemony or the ecological impacts of technology. Instead, they reflected the notion that technology is an exciting, always beneficial process which could take every person on something more exhilarating than a carnival ride. Every idea was communicated with the tone of "Isn't this marvelous?" High tech was the equivalent of high purpose and high spirit.⁴⁰

Marxist critics of the mass media would likely have unlimited comments on the potential of news organizations such as Channel One and YNN to shape the way children think about the world during their formative years. According to theorists like Herbert Marcuse, the media "define for us the very terms in which we are to 'think' (or not 'think') about the world."⁴¹ By this, Marcuse means that the media have the power to create reality: citizens don't understand the world as it really exists, but as it is interpreted through the media. James Curran, Michael Gurevitch and Janet Woollacott explain the implications of this power, arguing that "the mass media play a strategic role in reinforcing dominant social norms and values that legitimize the social system."⁴² In the case of Channel One, and by implication perhaps YNN, these social norms could be defined as capitalism, consumerism and the benefits of technology.

The tendency toward biased news could be counteracted by class discussion or solid

⁴⁰John C. Belland, "Is This the News?" Watching Channel One: The Convergence of Students, Technology, and Private Business ed. Ann De Vaney (New York: State University of New York Press, 1994) 93.

⁴¹Tony Bennett, "Theories of the Media, Theories of Society," Culture, Society and the Media eds. Michael Gurevitch, Tony Bennett, James Curran and Janet Woollacott (London: Methuen Press, 1982) 44.

⁴²James Curran, Michael Gurevitch, and Janet Woollacott, The Study of the Media: Theoretical Approaches (London: Methuen Press, 1982) 14.

media literacy courses, but research into Channel One suggests that won't happen.

Many observations of classroom procedures and informal questioning revealed that teachers usually did not introduce the Channel One program, nor did they follow through with any discussion of the program after its viewing. This left students to understand, interpret, and situate the news on their own with no meaningful grounding of the lesson.⁵⁵

There is little evidence to suggest Canadian schools will be any different in their implementation of YNN. According to Athena's contracts with schools, newscasts are to be aired in homeroom classes -- not within current events or media literacy courses. The reason is likely logistical, more than anything else, given high school timetabling. Homeroom classes would likely be the only class of the day all students must attend at the same time. Moreover, by scheduling the newscast for the homeroom period, it will not deduct classroom time from other courses on a daily basis. Further, not all schools offer media literacy courses. While media literacy used to be a required course for Grade 9 and 10 students in Ontario, the Ministry of Education scrapped the course in 1999.

The fact that these newscasts will add up to 62.5 minutes per five-day school week leaves a lot of room for inculcation of opinions, an issue that does concern Janet McDougald, chair of the Peel School District in which Meadowvale school resides. While McDougald supports the agreement, she is worried students will have trouble breaking down both the newscasts and advertising components of the broadcast.

"Unless you teach them media literacy they don't get it," she says. "The media literacy piece can be very valuable, but it has to be taught."

Carleton's Robin Farquhar, however, says while YNN does concern him, the agreements offer educators a chance to show leadership by measuring the pros and cons of business agreements and adapting agreements to meet academic needs.

⁵⁵Knupfer and Hayes 55.

Farquhar says YNN really offers schools one great benefit for one cost. Schools get high bandwidth Internet access, which they may not have been able to afford without help, as well as a networked computer lab. In return, they must show YNN broadcasts every morning. Educators could mitigate the costs, Farquhar says, through school-based decisions to expand homeroom periods so they last 30-minutes and, after instituting board-wide or in-house teacher training, use the time to teach students about media literacy.

"It (YNN) then becomes an excellent learning experience that wouldn't have been available to you if you hadn't entered the agreement," Farquhar explains. "Private money can make a lot of things possible."

ADVERTISING AND ITS INFLUENCE

The 2.5 minutes of advertisements in YNN's 14.5-minute broadcasts carry messages of their own, according to mass communication theorists who have consistently noted the power of advertising to reinforce consumerism.

"The most obvious ways in which cultural production services the wider system of material production is through advertising," writes Nicholas Garnham in *Capitalism and Communication: Global Culture and the Economics of Information*. "The existence of advertising media and their audiences constructed through the cultural practices of newspapers, magazines and broadcasting have been essential to the development of modern consumer capitalism."⁵⁴

Heather-jane Robinson expands on the pervasiveness of advertisers in *No More Teachers, No More Books*:

More than any other institution, corporations dominate our conceptions of how life should be lived. If you switch on your radio, flip on the television, or open

⁵⁴Nicholas Garnham, Communication and Capitalism (London: Sage, 1990) 13.

your newspaper, corporations speak to you. They do it through advertising... The average viewer now watches 22,000 commercials every year. That's how many times corporations place images in our brains to suggest that human life is most satisfying when inundated with their commodities... And between commercials there are programs, also created by and for corporations, that espouse values consistent with the ads.⁵⁵

Robertson may not be exaggerating. A 1997 study by the Consumers' Union found that 80 per cent of Channel One's news content was slanted towards the sponsors' products.⁵⁶

Not everyone, however, believes advertising is a negative. Athena's national advisory board chair Scott Conrod says he believes students are more media-savvy than some people give them credit for. He says today's students have been raised on commercials and will not be brainwashed by advertisers.

"That seems to be the fear of Heather-jane Robertson and some of the detractors, but I just can't understand it," he says. According to Conrod, there's always been advertising in schools -- when he was a child, he read textbooks sponsored by Caisse Populaire and the Royal Bank of Canada.

"I don't think it had an influence on which banks we ended up using," he says.

Robertson argues advertising in schools is dangerous whether it is done through YNN programs, computer screens or product agreements.

Many of these deals are little more than vehicles for advertising and opportunities for corporate tax write-offs. But the fundamental problem with partnerships is not that many of them are smarmy. The long-term problem is that public schools are becoming dependent on the private sector and its abiding approval. Partnered schools soon admit that they couldn't survive without the largesse of their corporate benefactors; predictably, the terms of the deals are ratcheted up as dependency increases. Corporations get what they want at both ends. The same players that have successfully led the lobby to reduce public spending get to selectively rescue the victims of the cuts and bask in their subsequent gratitude.⁵⁷

Ottawa-based Corel Corp., charges Simon Fraser University mass communications

⁵⁵Robertson, No More Teachers 24.

⁵⁶Gutstein 218.

⁵⁷Robertson, Shall We Dance? 5.

professor Donald Gutstein, offers an example of how corporations come to be seen as saviours. In 1999, the Province of Ontario signed a \$500,000 contract with Corel, following massive budget cuts,⁵⁸ in which the company provided equipment at a cut rate. The government was able to replace public money with private money, while the software deal would allow Corel to “cultivate brand loyalty among the customers of tomorrow.”⁵⁹

Corel, however, viewed the deal in a different light. It provided all publicly-funded Kindergarten to Grade 12 and OAC schools with Corel business software, which meant more than 2.5 million students at more than 5,000 schools would have access to Corel WordPerfect, Corel Quattro Pro, Corel Presentations, Netscape Navigator and CorelCENTRAL.

“Our products are seen as easier to use, more functional and one of the most cost effective academic offerings in the industry,” Patsy Hogan, Corel’s director of global sales programs, said following the April 2 announcement.⁶⁰

An agreement announced later that month with the B.C. Ministry of Education prompted Corel CEO Michael Cowpland to discuss the cost-saving benefits of such agreements.

“Corel has always been a strong supporter of Canadian schools,” Cowpland said. “This agreement provides an opportunity for students and educators to use top-of-the-line software at the best possible price.”

Cowpland’s statement was supported by Craig Young, of Craig Young Educational Consulting, who said: “By offering fixed-rate pricing, we’ve put the same purchasing power in the hands of small elementary schools as in the large urban universities. This

⁵⁸Gutstein 206.

⁵⁹Gutstein 205.

⁶⁰Corel, Corel News 2 April 1998 (<http://www.corel.com/news/1998/april/ont-min-of-ed.htm>).

means no school will be penalized because of the location of their school or the size of their order.”

Marketers, advertisers take new approach

The U.S.-based Center for Media Education (CME) suggests computers will allow more subtle forms of advertising to enter the marketplace -- including schools. CME further suggests advertisers and marketers have already begun to target the rapidly growing number of children online.

In 1996, the CME released a report called *Web of Deception: Threats to Children from Online Marketing*, which reported on a six-month investigation of online advertising and marketing practices directed at children. The investigation uncovered a number of disturbing practices, concluding that online advertisers pose two kinds of threats: one, the invasion of children's privacy through solicitation of personal information and tracking of online computer use; and, two, exploitation of vulnerable, young computer users through new unfair and deceptive forms of advertising.⁶¹ Advertisers invade children's privacy, the report found, through a variety of marketing techniques designed to collect data and compile profiles of children.

“Children are offered free gifts such as T-shirts or chances to win prizes like portable CD players if they will fill out online surveys about themselves. Tracking technologies make it possible to monitor every interaction between a child and an advertisement. The ultimate goal is to create personalized interactive ads designed to ‘microtarget’ the individual child.”

The second threat, according to the report, is the use of unfair and deceptive advertising practices. Because neither online services nor the World Wide Web are

⁶¹Center for Media Education, Web of Deception: Threats to Children from Online Marketing 1996 (<http://tap.epn.org/cme/cmwdcov.html>).

regulated. “marketers are able to pursue children with few or no restraints. As a consequence, advertising and content are often seamlessly interwoven in new online ‘infomercials’ for children.”

The marketers, according to the report, recognize that children today have unprecedented spending power. In addition, they are also early adopters of high-tech products, which makes them an even more important market. The CME report asked Saatchi & Saatchi Interactive director Erica Gruen about the importance of children to online advertisers.

“This is a medium for advertisers that is unprecedented,” she said. “There’s probably no other product or service that we can think of that is like it in terms of capturing kids’ interest.”

The CME’s findings are supported by other organizations. In 1998, the U.S. Federal Trade Commission surveyed more than 1,400 Web sites, more than 200 of which were children’s sites, to investigate online privacy. Almost 90 per cent of children’s sites (89 per cent, compared with an 85 per cent total overall) collected personal information from children. While 54 per cent of the sites provided some form of disclosure of their practices, only 23 per cent asked children to seek parental permission before submitting information.

LOGGING ON OR OFF?

The introduction of computers into schools may be encouraging schools to enter into agreements with businesses. It may also make schools more likely to accept advertising in exchange for products, as is the case with the Youth News Network. But advertising in schools hasn’t been accepted unanimously. The limited number of schools YNN has signed to date is suggestive of the debate. Protests have come not just from parents, but

from more authoritative sources.

As Athena's Gary Pelletier notes, however, more than 20 schools have already signed agreements with YNN, with an estimated 30 expected to be on board by September 2000. Athena will continue to discuss YNN with schools throughout the summer, Pelletier says, to try to encourage more schools to sign up.

The debate surrounding private-public partnerships in education isn't expected to end any time soon. The Canadian Teachers' Federation has a section on its Web site devoted to public education and the private sector, in which it cautions that "reduced funding for curriculum development and for the purchase of high-quality materials makes it more likely that school boards will enter into agreements that expose students to curricular materials that promote corporate interest."²

Athena's Scott Conrod is also convinced "money," in the form of networked computer labs they otherwise wouldn't be able to afford, is what will continue to convince more schools to sign up for YNN.

"Eventually, this thing will fly," he says. "If not today, it will fly one day. I think more and more schools, as there are more and more cutbacks, will realize it's worth it."

²Canadian Teachers' Federation, Education-Corporate Partnerships 1999 (<http://www.ctf-fce.ca/e/what/ni/public.htm>).

CHAPTER SIX

Speed bumps on the Information Highway

Every student in Canada will be sitting in a classroom that contains a computer connected to the Internet by March 31, 2001. At least they will be if Industry Canada's SchoolNet program proceeds as planned. There's little to indicate it won't, considering it already met its goal of connecting all schools to the Internet in March 1999.

From 2001 on, however, just how wired Canadian classrooms might become will depend in large part on individual provinces, schools and teachers. It is the provinces that will set targets for student-to-computer ratios and provide funding to meet these targets. Individual school districts or boards and schools will be able to build on the basics with discretionary funding, fund-raising efforts, agreements with corporate partners or private donors. Teachers, finally, will determine just how much emphasis to place on technology when creating their lesson plans.

There is, in fact, much that still remains to be seen.

But for those who have based at least part of their career on studying education and technology, there are various predictions about the future of computerized classrooms. Some of these predictions are compelling.

In his book *The Road Ahead*, former Microsoft CEO Bill Gates insists that putting computer technology to use in education will lead to benefits in every area of society, while also making school practical and enjoyable. His vision of tomorrow's classrooms wouldn't seem out of place in the science fiction films of the 1960s.

Although a classroom will still be a classroom, technology will transform a lot of the details. Classroom learning will include multimedia presentations, and homework will involve exploring electronic documents as much as textbooks, perhaps even more. Students will be encouraged to pursue areas of particular interest, and it will be easy for them to do so. Each pupil will be able to have his own question answered simultaneously with the other students' queries. A class will spend part of a day at a personal computer exploring information individually

or in groups. Then the students will bring back their thoughts and questions about the information they have discovered to the teacher, who will be able to decide which questions should be brought to the attention of the full class. While students are at their computers, the teacher will be free to work with individuals or small groups and focus less on lecturing and more on problem solving.¹

Once a positive atmosphere for education is established, Gates writes, the information highway will help raise the educational standards for everyone in future generations. Gates's projections are based on a belief that there will be a laptop computer on every desk.

Gates's enthusiasm is to be expected. According to some estimates, if just 10 per cent of the money spent on education in the United States and Canada each year was spent on technology, the market would reach \$60 billion annually.² Given Microsoft's domination of the market, those figures suggest that Gates's company would profit more than most.

Even those who don't stand to profit directly from sales of equipment to schools believe that education will evolve to fully incorporate computers into classroom activities -- and that students will benefit.

"Computing isn't about computers anymore. It's about living," writes Nicholas Negroponte, professor of media technology at the Massachusetts Institute of Technology. "Schools will change to become more like museums and playgrounds for children to assemble ideas and socialize with other children all over the world."³

The U.S. author of *Growing Up Digital*, a book based on research which involved several hundred children and adults on six continents, expresses a similarly optimistic viewpoint. Don Tapscott argues results already indicate students will benefit from learning online.

"The kids are all right. They are learning, developing, and thriving in the digital world.

¹Bill Gates, *The Road Ahead* (New York: Penguin Books, 1995) 187.

²Heather-jane Robertson, *No More Teachers, No More Book* (Toronto: McLelland & Stewart Inc., 1998) 126.

³Nicholas Negroponte, *being digital* (New York: Vintage Books, 1995) 6.

They need better tools, better access, more services, and more freedom to explore, not the opposite," he says. "Rather than hostility and mistrust on the part of adults, we need a change in thinking and in behaviour on the part of parents, educators, lawmakers and business leaders alike."¹

Seymour Papert, who like Negroponte also teaches at MIT, argues that it is as wrong for people to judge the success of computerized classrooms today as it was for people to judge the future of flight based on Orville and Wilbur Wright's first successful, 59-second test flight.

"Thinking about the future of education demands a similar labour of the imagination," Papert explains in his 1992 book *The Children's Machine*. "The prevalent literal-minded, 'what you see is what you get' approach measuring the effectiveness of computers in learning by the achievements in present-day classrooms makes it certain that tomorrow will always be the prisoner of yesterday. Indeed, the situation in education is often even worse than judging the effectiveness of airplanes by the 59-second-flight. It is more like attaching a jet engine to an old-fashioned wagon to see whether it will help the horses. Most probably it would frighten the animals and shake the wagon to pieces, 'proving' that jet technology is actually harmful to the enhancement of transportation."²

While other experts agree that classrooms will likely continue to computerize in the future, they argue the future may not be as utopian as some would suggest. Instead, they argue the trend could be dangerous -- to students and public education.

In her book *No More Teachers, No More Books*, Heather-jane Robertson, the director of professional development services for the Canadian Teachers' Federation, argues that public schools as they are today may disappear altogether if current trends in education

¹Don Tapscott, *Growing Up Digital* (New York: McGraw-Hill, 1998) 7.

²Seymour Papert *The Children's Machine: Rethinking School in the Age of the Computer* (New York: Basic Books, 1992) 29.

continue. She argues that cuts to education have forced schools to enter into agreements with private industry, giving businesses access to the student market, in exchange for computers and computer software. Unless protests stop education from deteriorating as it is, Robertson sees a time when students will learn in virtual classrooms over the computer -- a much cheaper way to educate students than traditional classrooms staffed by teachers.

"Teachers and books would be as vestigial as tails and extra toes," Robertson says, adding that businesses which create the educational software would call the shots."

Donald Gutstein, a mass communication professor at Simon Fraser University in British Columbia, reached a similar conclusion about the future of public education in his 1999 book *e.con: How the Internet Undermines Democracy*. He says ties between corporations and schools -- and the move towards computer-based instruction -- will transform the system so that education becomes a private, for-profit enterprise.

"The result will be a gradual disappearance of shared public information and community values, hallmarks of Canadian public education for a hundred years," he writes. "Once corporations have successfully "partnered" with educational institutions and built their own libraries of curriculum, there's little to stop them from establishing their own electronic-education centres and competing with the public system, which meanwhile is faced with dwindling resources...."

As both Robertson and Gutstein point out, such for-profit schools would bring an end to one of public education's major goals -- equity. Not all students could afford to attend what would likely be better-equipped, business-run schools.

There is some evidence to suggest that already schools which are strapped for cash

¹Robertson 5.

²Donald Gutstein, *e.con: How the Internet Undermines Democracy* (Toronto: Stoddart Publishing Co. Ltd., 1999) 197.

may find savings in online instruction.

Jim Coombs, principal of Broadmoor Junior High School in Sherwood Park, Alberta, says some schools in his area have used online lessons as an incentive to attract students to their schools. Once students register at the school, it is able to receive per-pupil funding from the government for those students. Then, the school can provide those students with the appropriate software so they can be schooled in their own homes. What happens is schools have money to cover the cost of educating these students -- but incur none of the expenses of actually educating those students in the classroom.

"There is a major cost-saving," says Coombs. "Schools are making money on online programs."

Barbara Campbell, principal of Mutchmor Public School in Ottawa, says equity will be difficult to achieve regardless of the role online communications or businesses come to play in education. Schools in wealthier areas will always be able to top up provincial funding to provide students with better technology than schools in less affluent areas."

There is further reason, however, for the likes of Robertson and Gutstein to be concerned about the end of public education and the fact that technology may hasten its end.

In Canada, public education is valued as highly as public health care -- and yet universal health care is also under attack. The Alberta government has passed legislation that some say paves the way to a two-tier health-care system, which would allow those with money to pay for treatment and skip lengthy waiting lists. In response, critics have argued that more money needs to be invested in health care to prevent other provinces from following suit. Apart from an aging population, one of the factors blamed on the

¹Jim Coombs, Broadmoor Junior High School principal, phone interview, 30 April 2000.
²Barbara Campbell, Mutchmor Public School principal, personal interview, 8 May 2000.

rising costs of health-care is the “high-tech, high-expense” medical revolution.¹⁰

It is possible that a “high-tech, high-expense” education revolution could result in similar proposals in the field of education.

TALKING 'BOUT A REVOLUTION

What the evidence suggests

While there is some merit to arguments on both ends of the spectrum, in reality the education system will not likely evolve in either fashion. Bill Gates’s vision of a laptop computer on every desk isn’t currently feasible. Nor is Gutstein and Robertson’s projection of an education system without teachers.

Schools haven’t come close to approaching a 1:1 student to computer ratio, nor is there funding to do so. And, as students have indicated, computers can help some students learn, but even students who enjoy online lessons still want direct interaction with their teachers.

Krystal Piamonte, one of the Grade 11 students studying chemistry online at Brookfield High School in Ottawa, said she wasn’t convinced students could take the online course from their home.

“Doing it as a correspondence course would be a lot more difficult unless you had an ongoing teacher or someone there to consult and help you out with it,” she says.¹¹

Teacher Gordon Kubanek says he needed to get a student teacher to teach his regular chemistry 11 course so he could spend more time with the students taking the course online.¹²

¹⁰David Gratzner, “Health reformaphobia” Ottawa Citizen 5 May 2000: A15.

¹¹Krystal Piamonte, Brookfield Secondary School student, personal interview, 20 April 2000.

¹²Gordon Kubanek, Brookfield Secondary School teacher, personal interview, 20 April 2000.

But just as neither vision of the future seems entirely accurate, neither does Seymour Papert's observation that it is too soon to judge the effectiveness of computer-enhanced learning. There is already significant evidence to suggest that computerized classrooms won't be the panacea to educational woes -- or the economy -- and may not be the best tool around which to organize the way education is delivered in Canada.

As Heather-jane Robertson writes, however, "thoughtful reflection on technology and school reform has become unfashionable. Debate is now limited to what brand of technology should be purchased and how fast it can be adopted."¹³

That may not be the best approach to take.

Computers, as educational tools, can be used in wonderful ways. As shown in *Chapter One*, students in Victoria, Brentwood Bay, Lillooet and Ottawa are gaining practical computer experience, while learning how to use current software in creative and practical ways. They also say they're having fun while they're learning, and they believe that the skills they're being taught will help them in the future.

Yet, there are also drawbacks associated with the process. First, students may be more inclined to copy and paste the information they've found online, and in doing so might not retain what they've learned. As Lillooet teacher Joel Wrinch says, students have a tendency to master the technology without understanding the information they've uncovered. "Students may not be well-served if they don't understand how municipal governments work, even if they do know how to access a Web site that would explain municipal politics to them."

Computers have also been touted as the answer to the "boredom" problem in schools. Reared on television, it's argued, students won't learn in traditional classrooms because they aren't entertaining enough. Can computers really solve this problem? The answer

¹³Robertson 5.

¹⁴Joel Wrinch, Lillooet Secondary School teacher, personal interview, 14 Dec. 1999.

isn't necessarily a Yes.

As Brookfield High School student Krystal Piamonte explains, how much fun a course is depends a lot on the teacher. Although she's studying chemistry online rather than as part of Gordon Kubanek's larger chemistry class, she says it would be more fun to be in the regular classroom.

"But for other teachers," she adds, "it would be a lot better to be working on the computers."

And elementary students at Mutchmor Public School in Ottawa appeared to be having more fun painting murals, than did their classmates working on computers. The majority of those who were working on computers weren't doing the work they were asked to do.

In many ways, the promises surrounding computers in education are no different than those that surrounded television and radio before that. Just as computers are expected to transform education, so too was television. While TVs have certainly proved useful in some cases, they haven't been added to every classroom and they haven't changed the role of the teacher. The "future" of education might have come as a surprise to some speakers at the Educational Television Conference in Newfoundland and Labrador in 1966. At the conference, Lina Graham, from the Nova Scotia Department of Education, had this to say about the future of teachers in classrooms with TVs.

With the advent of televised instruction, clarification of the teacher's role in the team-work involved is a prerequisite. A rewriting of the teacher's job description would be necessary and enlightening to many. The well produced program makes increasing demands upon the teacher's abilities. Faced with educational materials prepared by others, classroom teachers are confronted with challenging tasks. Television could become a blanket of standardized instruction if the classroom teacher abandoned his post. This can happen if the initial antagonism and the reservation of many teachers turns into permanent hostility or negation. Such an attitude would be based then on a failure to recognize that (Educational Television) rather than replacing the teacher makes increasing demands upon him as an educator. After four successful years of school telecasts, Nova Scotian educators are convinced that the TV instructor and the classroom teacher provide

an unbeatable academic team.¹⁵

Graham's comments are interesting -- and much like those being expressed about the benefits of computers today, and the need for teachers to become "guides on the side" rather than "sages on stages." Television did find a place in classrooms -- but it came to be seen as a tool, rather than as one part of a teaching tandem. Today, however, teachers are once again being told they need to become part of an unbeatable academic team, this time with computers at their side.

"Yesterday's quaint faith in an automotive or electrical utopia is today's software propaganda," writes Heather-jane Robertson. "We are still attached to the idea that new, complicated, and poorly understood technology can solve complex human problems. Again and again, we exaggerate the benefits of technology and overlook the risks."¹⁶

Carole James, vice-president of the Canadian School Board Association, says she's hopeful the computer craze will die down.

"Like many issues in education, there seems to be a pendulum and we're at the high end," James says, pointing to the rise and fall of the push to teach Phonics in schools in the late 1970s and early 80s. "I would hope technology would do the same thing -- and come back to that balance."

Rick Withers, a manager in the B.C. Ministry of Education's educational technology branch, says the craze is already starting to die down in some jurisdictions.

"There's certainly still strong pressure from all parents that students need to develop technology skills," Withers says. "But I think some of the panic that was there two years ago... has really diminished. There's less panic to say my kid has to have the same computers in his classroom as the kid next door."¹⁷

¹⁵Lewis Miller, Ed., Educational Television Conference in Newfoundland and Labrador (Ottawa: Queen's Printer, 1967) 60.

¹⁶Robertson 92.

¹⁷Rick Withers, manager, educational technology branch, B.C. Ministry of Education.

Greater Victoria's manager of educational technology, Denis Semair, says his school district has adopted a "use it or lose it" strategy -- if schools don't use the resources, they will be pulled and placed elsewhere.

"It's a small step towards accountability," he says.¹⁸

Meanwhile, evidence to date is at best mixed about the true benefits of computer-enhanced instruction. While there are studies that claim computers can help students learn, there is also evidence that suggests such studies are flawed because they focus on technology at the expense of all the other factors that contribute to a positive learning environment, including the teacher. In addition, there are just as many studies available that refute the benefits of computers in terms of student learning.

Others researchers, like U.S. educational psychologist Jane Healy, claim that computers can actually hinder the development of the human brain and are risky as an educational tool with children aged nine or younger.

Others argue that schools also need to teach children social skills and interaction -- skills that will suffer as schools place more emphasis on lessons delivered via the computer which turn social contacts into virtual ones.

Yet the concerns seem largely ignored by many of those making the decisions. Of the research cited on Industry Canada's SchoolNet Web site, there are no studies that discuss the problems of computer-enhanced learning. Plans still call for networked computers in all classrooms, regardless of whether students in all classrooms need those computers or will use those computers.

While education budgets have been slashed throughout the country, school districts have received money to invest in technology. And at the same time, the cutbacks have

phone interview, 23 May 2000.

¹⁸Denis Semair, manager of educational technology, Greater Victoria School District, phone interview, 19 May 2000.

forced them to close schools, add portables, reduce library expenditures and cut programs.

The choices may not be the best for students.

Although computers may help students at small schools in remote areas take online classes that may not have been offered at their school, computers can't be checked out and taken home for the night. That doesn't enhance "equity," the main purpose behind the public education system. Neither is equity enhanced when computers play a large role in lessons, benefiting students who have access to computers outside of school.

And while some studies report that computers will help students learn, there are other studies that promote the benefits of other educational programs -- programs which have been slashed as budgets have been cut. Music, physical education, and early literacy intervention programs have all been linked to improved academic performance -- and better lives.

There is also concern that money isn't being invested where it would make the most difference. The infrastructure, hardware and software needs to be in place, but teachers also need to learn how to use the equipment in effective ways for it to truly benefit students. To date, not enough funding has been directed towards teacher training for this to have occurred.

Ross Mutton, president of the Ottawa-based Association for Media Technology in Education in Canada (AMTEC), says his organization has called for funding for technology -- as well as teacher training and support -- since the early 1990s.

"What came out of it was the money for technology," Mutton says. "But they haven't dealt with the thornier issue of how to make it work."¹⁹

Computers and computer software are also expensive -- particularly at a time when

¹⁹Ross Mutton, Association for Media Technology in Education in Canada president, personal interview 20 March 2000.

governments don't have extra money to spend and cutbacks are being made in other areas. Once the infrastructure is in place, one cost will be eliminated, but will be replaced by myriad others. While overhead projectors can last more than 20 years, ever-evolving computers don't last that long. They need to be repaired, replaced and updated.

Technicians also need to be hired to repair the equipment, as do information technology coordinators to oversee the implementation and use of technology in schools. Teachers must be trained. New software must be purchased. Internet connection needs to be paid for.

James says Canadian trustees have yet to be convinced computers will save the education system.

"Most people recognize you have to have some technology for kids. That's part of life now. But there is a debate about how far you should go and whether you'll be able to keep up. And at the expense of what?"

Computers also bring a new set of concerns into classrooms -- including advertising. Canadian parents, generally, are opposed to advertising, yet are more likely to accept advertising in schools if the advertising is delivered via the computer. Furthermore, a 1997 national poll by Environics found that 75 per cent of people surveyed favoured closer ties to business at both the primary and secondary school levels. And 53 per cent of respondents to an Angus Reid Group survey in 1999 agreed with the statement that public school boards should accept corporate donations, such as computer equipment, in exchange for allowing advertising in classrooms.

Already, companies are trying to take advantage of the new, lucrative market of students at schools. After 10 years of trying, the Youth News Network began airing its newscasts -- with advertising -- at several Canadian schools in 2000. The newscasts eat up about 14.5 minutes of class time each day, but in exchange schools receive televisions

and VCRs for every classroom and a fully-networked computer lab. The price tag of the equipment? Up to \$200,000 per school, depending on the student population.

Other companies, including Bill Gates's Microsoft, have also donated money and computer equipment to schools -- including a \$1 million donation to Industry Canada's SchoolNet program. Critics wonder whether such donations are about altruism -- or building a generation of students loyal to certain products. And, if the latter is the case, whether schools should be turned into markets.

The increasing acceptance -- and reliance -- on relationships between schools and businesses also plays into the fears of Robertson and Gutstein, who are concerned about the commercialization of Canada's schools and ties to business.

What it all means

This far into the plan to computerize Canadian classrooms, it's unlikely governments will change their collective minds and decide education dollars could be better spent elsewhere. And given the increasingly important role of information technology in society, it is important some computers be added to schools to give all students a head start on learning how to use technology -- whatever their economic background. Like encyclopedias and other resources, CD-ROM references and the Internet, when used wisely, are valuable research tools.

It's also just as unlikely that, given federal and provincial debt totals in the billions of dollars, money will suddenly be available for investment in other areas of education.

What this means is the money that is being spent on education needs to be spent wisely.

"The government has to take a step back," says James. "They need to step back and see the key issue isn't the number of computers, but what we use them for. And if they do

that, they can compare them to other programs and what we use them for. They need to look at the educational benefit rather than technology for technology's sake. Right now, we're getting caught up in the bells and whistles."

The British Columbia government hasn't reached the stage where it's comparing its technology programs to other programs that are being cut back, and it still plans to spend about \$40 million on technology next year. But the Ministry of Education's Rick Withers says the government is starting to look beyond student-to-computer ratios and wired classrooms. Its new five-year technology plan, which takes effect in July 2000, will instead focus on using computer technology in Grades 6 through 9 and investing money in teacher training and support rather than hardware.

But projections about the future of education are only that -- projections.

"No matter how crazy we can predict stuff out of this particular revolution, there will be things that will become commonplace in the next 10 years that we can't even guess at right now," says AMTEC's Ross Mutton.

Even the future of computers and the Internet themselves are open to debate.

Mark Starowicz, head of documentaries for CBC television, predicts that in the not-too-distant future, the Internet will converge with television and radio. According to Starowicz, the only thing that has kept television off the Internet to date is bandwidth -- which has been too narrow to carry a television signal. Recent research, however, suggests that technology has evolved to the point where we will soon be able to deliver 1,000 billion bits per second on fibre optic cables -- or a million television channels concurrently.

There's little to indicate anything available online will be regulated soon. The Canadian Radio-Telecommunications Commission (CRTC) has already said it's not interested in regulating the Internet. And that will mean anyone can post anything they

want to on the Internet, making it even more difficult for students and teachers to determine what information is worthwhile.

"Commerce, banking, the stock markets, the mail, parts of radio, music, even pornography -- they have all started migrating to the new Internet platform, but the arrival of television will be transforming," Starowicz says.²⁰

If television and radio become one with the Internet, how different will the Internet be from TV as a source of entertainment? If the convergence occurs -- and the Internet is left unregulated and open to worldwide competition -- there will be an even greater need for information to be put in context.

"On the Internet, the problem is not channel and frequency scarcity, as was the case with broadcasting media, but abundance," explains Simon Fraser University mass communication professor Donald Gutstein. "There is so much material on the Internet that the sheer magnitude creates a dearth of attention."²¹

Just having access to the information -- through computerized classrooms -- may then have little educational value. What students really need is someone to compile information and put it context, because access to information in and of itself is meaningless.

"There's information and then there's knowledge," says Canadian Teachers' Federation's Bernie Froese-Germaine says. "People confuse the debate."²²

There is no telling how the future will unfold. There is no guaranteeing that, if computers are eventually found to have no positive educational affect, governments will

²⁰Mark Starowicz, "The Great Media Shift: Television, Radio and Print in the 21st Century: Speculations on the Impact of New Technologies," First Annual Kesterton Lecture, School of Journalism and Communication, Carleton University, Ottawa, 10 Feb. 2000.

²¹Gutstein 283.

²²Bernie Froese-Germaine, assistant researcher, research and technology department, Canadian Teachers' Federation, phone interview, 5 May 2000.

quit investing in technology and invest in other areas instead.

The SchoolNet National Advisory Board has been set up to monitor the application of technology in schools. In addition to federal representatives, the board also includes representatives from the provincial ministries of education, teachers' federations and parents' associations.

"They will really sit down and look at the action we should be taking," says SchoolNet programs spokesperson Rachel Roy.²³

But technology can't be studied in isolation from other programs in the education system. Its success as a learning tool needs to be compared with the success of other learning tools and programs.

"The jury is still out on technology," says Bernie Froese-Germaine.

However, verdicts were delivered long ago on the benefits of many programs under the knife. Community schools, classrooms, music programs, gyms, libraries, literacy programs, counsellors and social workers all contribute to the quality of education students receive. When money is invested in technology -- even if it comes from a different budget -- it still reflects a choice.

And this choice appears to be driving schools down the information highway at a rapid pace. When Industry Canada announced all public schools had been connected to the Internet in 1999, it proudly proclaimed Canada as the most connected country in the world. With the emphasis now on connecting classrooms, Industry Canada's Doug Hull says waiting for research results about the benefits of computerized classrooms, waiting for prices to come down, or waiting for teachers to be trained could be riskier than proceeding full speed ahead.

"We'll be way, way behind where we need to be competitive in the world in terms of

²³Rachel Roy, programs spokesperson, SchoolNet, phone interview, 21 Feb. 2000.

learning and also just to live in a competitive and productive country.” Hull says.²⁴

Yet schools are about more than creating a competitive and productive country -- they’re also about creating thoughtful and intelligent citizens. If in the rush to computerize technology isn’t used wisely, the decisions could have a major impact on society because schools are dealing with children -- and in dealing with children, they’re shaping the future.

Computers may play a role in that future, but an over-emphasis on technology could be as dangerous as an under-emphasis.

“For some kids using technology is a way of connecting them. But I worry at what I see, at the shift I see across the country, because some governments do see it as a saviour to fix the problems,” says Carole James. “Far too often, technology is seen as the saviour that will solve all the problems. But the sensible way to look at technology is to see it as one more tool -- just as a pen was.”

Perhaps the need to be sensible is the one thing both proponents and opponents of wired classrooms agree on.

What they can’t yet agree on is what is sensible when it comes to providing Canadian children with the best education possible in an era of exploding technological possibilities.

²⁴Hull, Doug, interview, The Wired Classroom, Canadian Broadcasting Corporation, cbc.ca, April 2000 (<http://cbc.ca/wiredclassroom/episodes.html>).

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