MA MAJOR RESEARCH PAPER

BEST PRACTICES?

Competing Educational Philosophies, ICT Implementation, and the Neoliberal Agenda Promoted by the Council of Ministers of Education, Canada (CMEC)

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Education is not the filling of a pail,
but the lighting of a fire.
W.B. Yeats

Human history becomes more and more a race between education and catastrophe.
H.G. Wells

There won't be schools in the future...
I think the computer will blow up the school.
S. Papert

INTRODUCTION

The process of educating, of passing on the spirit of inquiry and wisdom in all its forms, is as old as humanity itself. From the oral tradition of Socrates and Plato, through the development of the Phoenician alphabet and Gutenberg's printing press, through the rise of the public school during the Industrial Revolution, and through the many inventions of the twentieth century, education has been an intersection of social practices, technological innovation, and competing ideological visions about children, learners, and what constitutes knowledge. Today's educational landscape is no different, with educators confronting the many challenges of globalization, diasporic cultures, and, the focus of this study, rapidly advancing digital technologies. It is my intention to use the pronouncements and initiatives of the Council of Ministers of Education, Canada (CMEC) to examine the ideologically-determined possibilities envisioned for emerging technologies. To this end, the CMEC will not serve as an exhaustive case study but rather as an example of how high-level, heavily politicized policy choices are and will profoundly affect the structure, if not the very existence, of elementary and secondary public schooling in Canada. I will argue that the CMEC is an increasingly powerful coordinator on national pedagogical questions and is part of a broader trend towards privileging neoliberalist principles. Operating on both a contradictory and deterministic philosophy, I will argue that neoliberalism, embodied by the Council, is leading public education down the road not to a future where the liberal arts, individual needs and market criterion are balanced but rather to a more centralized, homogenizing, and weaker system which prizes

economic utility over democratic virtues and individual growth. Further, not only is the position of the CMEC deeply paradoxical but, in the end, neither educational future it offers—radically child-centredness nor the hyper-competitiveness fostered by its policy initiatives—is in fact desirable.

In these liminal days, we must ask ourselves a number of important questions. First, why do we educate, is there a teleological narrative which guides the development of educational means and technique? Second, how shall the power to make educational decisions be dispersed? Third, are digital information and communication technologies (ICTs) in the classroom going to do more educational harm than good. Fourth, whatever the answer to the previous question, do educators and parents have any real control over the implementation of ICTs or is technology a self-propelled force operating outside the bounds of human direction? The answers to these questions are vital in an age where information has become ubiquitous, where speed has become God (and time the Devil), where technological is fetishized if not anthropomorphized, and where inter"national" competition has both intensified and been muddied by globalization's challenge to the power of the traditional nation-state. In order to begin to address these questions I will open my paper with a sketch of the broad educational milieu in Canada followed by a general description of who and what the CMEC is, its activities to date, and the Council's stated vision of how digital technologies will alter public schooling in Canada. The CMEC's position on the application of technology to education will then be contextualized through an investigation of relevant literature. This review, organized conceptually but also attempting to provide an historical perspective, necessarily deals not only with technology but with broader educational theory as well. Wider educational theory will help make manifest that the debate surrounding technology in the classroom is in reality a subset of a larger discourse, one that spans the distance between the polarized camps of child/learner-centred models and more traditional teacher-centred models.

In the second half of the paper I will revisit the policies and documents of the CMEC, conducting a close reading of its pronouncements concerning technology and contrasting this against the potential effects of and philosophies behind nation-wide curriculums and standardized tests. Invoking theories from a diverse range of thinkers—including Neil Postman, Paul Levinson, Heather-Jane Robertson, Anthony Giddens, Stanley Aronowitz, Henry Giroux, Seymour Papert, and others—I will use the conceptual framework provided by the CMEC as a springboard into a broader discussion of technological determinism, vocationalism, democracy, and social and political structure in general. In this way, we might take the notion of 'best practices', a concept usually specific to pedagogical practice, and invest it with much wider connotations in applying it at an ontological level. I have resisted the attempt to align the idea of public schooling with the right or left, the traditional or the modern, the modern or the postmodern, or the artificial choice between child-centred versus teacher-centred models. Moreover, I reject the creation of abstract and impossible binaries between a Luddite destiny or a technologically-saturated educational future. By taking the 'best practices' from each possibility, I will argue that Canadians can cultivate an educational system which provides balance, foresight and wisdom, but also accountability and high standards. Rejecting "either/or" impulses and arguments of mutual exclusivity, I attempt to outline in fairly broad terms the ideological foundation necessary for a public education system which nourishes inquiry and empowerment while simultaneously providing valuable direction and developing self-discipline.

PART I – Covering the Conceptual Ground

TECHNOLOGY

It seems prudent to begin with a short etymological and definitional investigation of *technology*, to establish its roots and its current usage in order to formulate a working definition for this study. From the combination of the Greek 'techne', a craft or art or science employed in the making or fashioning of something, and 'logos', denoting speech, words, and/or reason as well as implying unification and collection, notable thinkers of the period such as Plato and Aristotle found in 'techne' inherently political decisions. Indeed, the transformation of objects or practices into a state that differs from their original state, or from their 'natural' state, was highly charged with questions of teleology, morality, and, in some instances, spirituality (Slopek, 2002). This beginning is not so different from the definitions appearing in modern dictionaries, though the original dualism of the Greek conception, acknowledging speech, words, and reason at the same time as material production and technical advances, instead of focussing simply on the latter, seems more intriguing and, in the end, offers a broader, more inclusive, and therefore more useful concept. Ursula Franklin, in her 1992 book *The Real World of Technology*, offers this comprehensive definition of technology:

> Technology is a *system*. It entails far more than its individual material components. Technology involves organization, procedures, symbols, new words, equations, and, most of all, a mindset...Like democracy, technology is a multifaceted entity. It includes activities as well as a body of knowledge, structures as well as the act of structuring. (p.12-14)

I want to take from this quote its descriptive value, for it is both broad and vague enough not to leave out the often excluded technology of language, nor does it exclude rudimentary tools or the concepts which allow us to imagine technological innovation or alternate uses for already existing tools.

Throughout the paper, where possible I will specify which technology I am speaking of—mostly ICTs—but if and when I employ the term "technology" I will be using it as Franklin does: to describe a "system" of manipulating, relating to, and thinking about the world around us. It seems appropriate to declare here that this is not a paper *against* nor *for* technology, I am neither a technophobe nor a technophile. Although I, like everyone, possess biases I have attempted to approach the issue of technology and its application to education with as open a (critical) mind as possible, focusing on the human practices and decisions which imbue individual technologies, and technology in general, with the ability to affect. As Neil Postman (1995) explains, to approach a topic from a critical standpoint is not the same as approaching a topic with pre-existing phobias:

> To be "against technology" makes no more sense than to be "against food." We can't live without either. But to observe that it is dangerous to eat too much food, or to eat food that has no nutritional value, is not to be "antifood." (p.191)

PUBLIC EDUCATION IN CANADA: Contested Origin, Contested Future

We can trace the seeds of the modern school all the way back to the elites of ancient Greece who would send their children off in the morning to see their teachers. While most children spent their days with parents and mentors, learning what they needed through direct experience, a formative model of the present schooling system was contained in these pedagogical centres as well as early libraries open to all those who could read (Levinson, 1997). After the Phoenician alphabet, the next major development to have a revolutionary impact was Gutenberg's printing press, early in the sixteenth century, which had tremendous impact on the structure of society, the development of knowledge, and the generation of education "systems." Neil Postman (1995) considers the explosion of information, in the form of the book, as generating a fair amount of anxiety and

confusion and that what has come to be called a curriculum was really just a logical move towards "organizing, limiting, and discriminating among available sources of information" (p.63). In a somewhat pejorative tone, Postman claims schools as the first bureaucracy of the technocrats, a rather broad group he continually vilifies, and schools "a means of governing the ecology of information" (p.63).

Paul Levinson, in his book *The Soft Edge* (1997), describes the same process in a more positive light. His interpretation is that:

> New media create new information, which in turn requires new modes of acquisition. But the rise of public education, especially at the early grade levels, had a far more fundamental connection to the printing press. People had need of intellectual tools, the skill and wherewithal, to receive and process the information that flowed from the press. People required a facility sufficient for the new vessel of this new information, the book, to dock – and for its passengers, the ideas it conveyed, to debark and be fruitfully engaged. People had to learn how to read. (p.31)

This rise in literacy had significant secondary effects, one of the most import of which was shaping the environment for the (re)birth and cultivation of democracy at nationwide levels. Levinson makes the point that the "same informed public which played a role in the Scientific Revolution could serve as an informed electorate" (p.32). This link between democracy, wide-spread education, and the literacy it engendered is echoed by Canadian author John Ralston Saul (1998) who explains how, as the debates around democracy crystallized during the 1830s and 1840s, the issue of education in Canada was of crucial importance to such 'founding fathers' as Papineau, Mackenzie, and later, Lafontaine and Baldwin.

> It was through the creation of a public education system that you would be able to have a self-sustaining democracy, because it would give the citizens the tools to act as citizens on a regular basis...they would actually be able to enter in on the debate. The whole theory was that citizens are created in public schools...Most Canadians believe the country came into existence by accident – passively – whereas in reality, this is one of the most consciously and intellectually created countries in the world. (p.17)

This analysis of public education, one which finds democracy at the roots, has not gone uncontested. Like every other facet of public education, the reasons for its creation are disputed along ideological lines.

One major stream of analysis, steeped in Marxist thought, argues that the origins of public education has little to do with democracy, even if it employs the language of democracy and liberal rights. Rather, public education has everything to do with control, repression, and hegemonic class domination. Lloyd and Thomas, in their book *Culture and the State* (1998), conduct a close historical analysis of public education as it formed in Britain during the 19th century. Reviewing numerous histories, the authors conclude that the development of public education, or government schooling, was driven in large part by religious and bureaucratic initiatives looking to produce what Lloyd and Thomas call a "manageable population" (p.19). They also find that there is widespread agreement that, quoting historian Richard Johnson, "the early Victorian obsession with the education of the poor is best understood as a concern about authority, about power, about the assertion (or the reassertion) of control" (p.19). Both radicals and reformers were explicit that "the expanding system of education was understood at the time as an instrument of social control directed specifically at the working class" (p.19). This analysis is supported by Alison Taylor (1997) who claims that the roots of universal, compulsory schooling in Canada were in many ways an attempt to "combat and control pauperism and crime among urban children; in other words, it began with a social control purpose, to which was later added an economic purpose" (p.11). Drawing fuel not from democratic ideals but from the desires and needs of industrialists, Taylor looks specifically at Ontario and amendments to the 1871 School Act which "empowered school boards to establish industrial schools for 'otherwise neglected children'" (p.11). Moving children from family to 'managerial' capitalism, which the amendments effectively did, was consistent with

public education being increasingly viewed as part of what Taylor calls a "national industrial strategy" (p.12). Taylor concludes that this vocational orientation, and the coordinating business organizations of the day, were instrumental in accomplishing "hegemonic work" (p.12).

Another analysis of the origins of public schooling finds a tripartite of factors engendering its creation. Canadian educational theorist Ken Osborne (1999) writes that, "Only in the nineteenth century did universal and compulsory schooling, paid for and controlled by government, become a practical possibility, largely through the coming together of three powerful forces: industrialism, nationalism and democracy" (p.5). Factory-owners saw in schools a vehicle through which to produce "reliable, productive and clock-based work habits from their workers" (p.6). Nationalists found in schools the means of building a nation through the teaching of a common language, songs and stories, all of which yielded patriotic citizens "proud of their own country and suspicious of all others" (p.6). In its democratic version, nationalism embodied the belief that a country belonged to the people and not to monarchs or dictators, no matter how benevolent: "Education was necessary if democratic citizenship was to be a reality. Even more, education was a fundamental right of citizenship" (p.7).

From these beginnings, however interpreted, public education in Canada and most of the Western world developed at a steady pace through the twentieth century: more students graduated high school, more funding was allocated, more training was asked for and of teachers, and, of course, the debate never ceased. From around the end of World War II until the late 1970s the broad welfare state enjoyed its greatest strength in Canada. For many, the educational system was deemed the medium through which "inclusive citizenship" (Sears, 2000, p.151) could be fostered, democratic goals achieved, and a nation manufactured[1]. At the core of the welfare state, then, was a

[1] Obviously, the drive for nationalism is often contested along, among others, ethnic, religious, and

profound optimism, a nationalistic spirit that saw the educational system as possessing the potential to turn a malleable population into a productive and cohesive whole (Sears, 2000), merging the ideals of multiculturalism with the collective economic needs of the nation. Then, entering the 1980s, public opinion and political choices made a decided shift towards what can be generally termed neoliberalism, though there are clearly undercurrents of traditional conservatism moving through much of the neoliberal reforms. Following the lead of Ronald Reagan and Margaret Thatcher, provincial and federal governments in Canada moved in the direction of fiscal restraint, deregulation, privatization, debt-reduction, individualism, and doing "more for less" (Gidney, 1999). This sociopolitical environment, oriented around local and global competition, translated into spending cuts to many social programs (or at least the refusal to match funding to inflation), most notably to social assistance, employment programs, health, and, not surprisingly, education (White, 1998).

Hand-in-hand with these broader shifts, educational "reformers" began amassing support unlike any they had been able to summon before. Two of the most popular include the charter school movement and home schooling, both of which emphasize choice and the freedom from a supposedly bloated, bureaucratized, and inflexible system. From another direction, powerful lobby groups urged governments to ensure that the education system was keeping Canadian youth, and therefore Canadian companies, globally competitive (Sears, 2000). Central to most reform visions, it seems, has been technology. More specifically, and more recently, digital technologies have played a major role in making these reform movements possible and, for an increasing percentage of the population, desirable. To this end, and with the support of a great number of Canadians, the

linguistic lines. In Canada, Quebec's education system has frequently been used to advance a francophone (v. federal) agenda, though Quebec remains a vocal participant within the provincially created and administered CMEC.

governing Liberal Party laid out extremely ambitious plans for the integration of ICT into Canadian libraries and schools. On March 30, 1999, Canada officially became the first country to connect all of its public schools and libraries—a total of 18,263—to the "Information Highway" and since then has been working to connect to the Internet at least one computer in each of the country's 250,000 elementary and secondary classrooms (<www.schoolnet.ca>). To help achieve these goals, the Government of Canada spearheaded the creation of SchoolNet, a partnership between national and provincial governments, the education community, and the private sector. As its mission, "SchoolNet readies learners for the knowledge-based society. It champions lifelong learning and the creation of world-class educational resources through information and communication technology and partnerships" (<www.schoolnet.ca>).

With educational authority residing at the provincial level, it is natural that SchoolNet both competes and compliments technological initiatives emanating from provincial ministries. While the goals of SchoolNet might dovetail nicely with the designs of most provincial governments, any hint that the federal government is looking to increase its power or set the agenda in the educational sector has and certainly will create uneasiness if not hostility within the provinces. However, the fact that control is held at the provincial level does not negate the possibility of a pan-Canadian initiative regarding technology and technological education. A potential source for such cooperation is the "Council of Ministers of Education, Canada," a group which has real and symbolic power in mapping out the future of schooling in Canada, and which has become an increasingly important entity with regards to national educational reforms.

THE COUNCIL OF MINISTERS OF EDUCATION, CANADA (CMEC)

Established in 1967 by the nation's elementary-secondary and postsecondary education ministers, the CMEC was designed to increase cooperation among the provinces and territories and act as the "ministers' mechanism for consulting on matters of mutual interest, representing Canadian education internationally, providing liaison with various federal departments, and cooperating with other national education organizations"(1996, p.5). In its 1993 "Victoria Declaration" the CMEC rearticulated its *raison d'etre* and the means with which it would achieve such ends. Justifying its existence the Council states that:

> Canadians want access to education and credit for learning and experience to be extended more consistently on a national basis across provincial, territorial or institutional boundaries. Canadians are also concerned with promoting more flexible relationships between education and the world of work. The changes the world is currently experiencing call for readjustment of outdated linkages and relationships. (p.2)

Further, the Council argues that when faced with common problems such as globalization, multiculturalism, needs for skilled labour, and technological advances, "it is clearly in our interest to adopt a national approach in dealing with them." To this end, the CMEC stated that its "actions" would focus on four crucial themes: the quality of education, accountability, accessibility, and mobility.

While the Canadian constitution ensures that education is a provincial matter, and there will always exist degrees of contention and contrasting agendas, in the last decade the council has lived up to its proclamation and taken an ever more active position, acting as a pan-Canadian conduit through which the School Achievement Indicators Program (SAIP) is administered. A standardized assessment of student achievement in mathematics, reading and writing, and science begun in 1993 (2001), the SAIP is used to compare the performance of 13- and 16-year-old students across Canada as well as internationally. The second major thrust of the Council is the Pan-Canadian Protocol for

Collaboration on School Curriculum, a 1995 venture which attempts to achieve national curricular consistency. The first product of this new protocol was "The Common Framework of Science Learning Outcomes: K to 12" (1996) which outlined both general and specific goals necessary to achieve nation-wide 'scientific literacy.' The stated purpose of this first framework, among other subject-area frameworks still to come, is to make student mobility easier, to develop pan-Canadian learning resources, and to increase collaboration and professional development among teachers of science.

Currently, besides the above mentioned initiatives, the CMEC has established as its priorities: 1) teacher and student mobility; 2) copyright; 3) French-language education in minority settings; 4) issues related to curriculum; and 5) information technologies in learning and teaching (2002). This latter priority, the focus of this paper of course, has been addressed in some length in a number of CMEC documents. While the Council has yet to initiate any type of action-oriented national framework to direct and harmonize technological implementation and/or technological education, its vision of how digital technologies will impact upon schooling, at both the theoretical and practical level, has been clearly stated in two primary documents—"Towards Well-Balanced Technology-Enhanced Learning Environments" (1997a) and "Developments in Information Technologies in Education" (1997b). Posted on the website, and presented by the CMEC representatives at both the national and international level, these documents provide a unified public position(s) for the CMEC.

With the assumption that "there is much commonality in approaches and in policy positions on technology" among the provinces, and that ICTs "central role in education is seen as instrumental in building the Canadian economy and society," the CMEC positions itself as the facilitator between the provinces and territories and the federal government on matters of ICT (1997b, p.7). As its

priorities, the CMEC looks to develop a national common vision that will compliment those of the provinces and territories, review teacher education with regards to ICT, increase collaboration, and, finally, set out a framework for ICT learning outcomes of students (1997b, p.7). Principal concerns affecting such goals include: funding, equal access among students at school, access at home, a current lack of attention to teacher training, barriers to collaboration, and issues related to copyright (1997b, p.30). The rationale for a massive increase of attention to information technologies is based on a number of important premises. The first is that "throughout history, new technologies have supported new forms of social interaction" (1997a, p.7). Second, general educational results are falling far below social expectations, students are becoming more assertive, students' training is inadequate, and "it is evident that the time has come for a change" (1997a, p.8). The third premise, emerging very much as a synthesis of the previous two, is that:

> For many students, especially those who are unmotivated and feel school is irrelevant, information technologies can become the link between the school and their real world. Information technologies can make school relevant to learners, and motivate them to greater efforts as well as prompting them to rethink their attitudes to learning and schooling...they should understand that almost every conceivable future work possibility will require the ability to use the new technologies. (1997b, p.9)

The closing point of the above quote underlines one major justification for the implementation of technology, namely, its relationship with work and competitiveness.

An essential tool of the "business of education" (1997b, p.9), ICTs are also an indispensible tool to the business of business. ICTs are changing the role of students who will assume "more responsibility for their learning, using collaborative, technological and problem-solving skills, all of which are required in the global marketplace" (1997b, p.13): "The individual is challenged to give more of him or herself – and to face the downside of these demands" (1997a, p.3). For the CMEC, in its presentation to other education ministers of the Commonwealth, it is accepted that:

> Information technologies can help bridge the gap between the worlds of education and work. Computer literacy is one of the skills Canadians will need to survive in the new knowledge-based economy...There is agreement that there must be a close relationship between the technical skills students learn at school and those required in the workplace. Business and other education partners must be involved in reviewing the skill-set to ensure relevance. (1997b, p.26)

Not only do ICTs make the linkage between work and school a more necessary *and* comfortable one, but they will help the "business of schooling" become more efficient both financially and pedagogically.

The rationale put forth by the CMEC is that "[n]ew technologies will transform the classroom since they encourage fundamentally different forms of interaction among students and teachers. They engage students systematically in higher-order cognitive tasks, and prompt teachers to question old assumptions about instruction." One of the key factors to these changes is the idea that, once ICTs have been introduced into schools, "[l]earning becomes separated from time (schedules, hours of schooling as a measure of achievement) and place (classrooms, schools, and universities)." Thus, as "students take greater responsibility for assessing themselves [with self-administered tests available on computers], the pace of learning changes and becomes more individualized" (1997b, p.13). According to the CMEC, the current "teacher-centered mode of teaching is a highly centralized. Some students find it too slow, and are likely to resent more and more overtly having to adjust their learning speed to the whole class" (1997a, p.4). A move to a more learner-centred model of education, both fostered and supported by digital technologies, is the answer to growing diversity among students due to age, ethnicity, learning style, or location. The CMEC feels that educators can no longer look to an "assembly line" as a metaphor for education, that society, students, and business leaders will no longer accept it. Rather, teachers will have to shift from "knowledge transmitters to guides, leaders, resources, program designers, and facilitators

of learning as well as models of educated persons" (1997b, p.14).

The CMEC acknowledges that, initially, ICTs are an added cost: in "the beginning of the integration process, ICTs are likely to be considered as superfluous. Teaching practices remain the same, and multi-media materials that directly support approved curriculum are sparse (1997a, p.8). Compounding the problem, "many teachers do not embrace the new technologies, and are skeptical of their application in the classroom" (1997b, p.13). Despite a perceived lack of support from an aging teacher population, a lack of access in many parts, and budgetary constraints, the CMEC is confident that "most educational institutions in Canada are only just beginning to tap into the potential uses of a broad range of information and communicative technologies as pedagogical tools" (1997b, p. 9). The CMEC is not alone in its optimism, nor is it alone in its belief that ICTs are fundamental to economic and vocational competitiveness. Before proceeding with a critique of the CMEC's practices and rhetoric, it is important to place the organization's assumptions within the larger educational discourse. A deeper understanding of the central ideological power struggles within the world of pedagogy, and beyond, will provide the context necessary for a more holistic study of education in Canada, and the myriad paths it might take.

UNDERSTANDING THE MOTIVES: Technology and Schools

The songs of progress, calling on public schools to adopt each and every new technology, have endured since the establishment of formal education systems (Cuban, 1986). Long before and long after Thomas Edison predicted in 1922 that the motion picture would "supplant largely, if not entirely, the use of textbooks" (in Upitis, 1999, p.155), new technologies were trumpeted as catalysts, ushering in not just progress but "revolutions" in education and hailed as transformative tools which would rise panacea-like to heal whatever ailed the schooling process. Among the

presupposed revolutionaries were the radio, lantern slide, tape-recorder, overhead projector, reading kit, language laboratory, television (Armstrong and Casement, 1998) and VCR. Over the last decade and a half, however, the drumbeat of these songs have quickened within the world of education, energized by rapid innovations in digital processing and global communication networks. The potential of the new digital technology is unlike any which has preceded it this century, if not going all the way back to Gutenberg's printing press. While the original few waves of computers always had one foot across the threshold of the school storage closet (Graham, 1997), today's superior machine, with its multi-media tools, user-friendly software, exponentially faster processing speed, and high-speed Internet capability, has provided the impetus for a new round of calls for educational reform. In the name of clarity, I have grouped theorists into three schools of thought: the *Techno-Promoters*, the *Techno-Pragmatists*, and the *Techno-Dissidents*. In terms of the last group, I choose "dissidents" and the political connotations it carries rather than, say, "skeptics" (Reinecke, 1982, p.12), in order to highlight the ideological and non-reactionary, serious nature of their criticism. I borrow "Techno-Pragmatists" from Ian Reinecke (1982: 12), though it will become evident that I do not share his degree of disdain and condescension for those who attempt to "negotiate" their way through the complex and often polarized world of educational theory. It must be emphasized that these are not discrete categories, rather they are useful markers along a continuum of thought engaging the application of digital innovations to education.

The Techno-Promoters

This category of individual and organizational stakeholders, leading the push for the rapid diffusion of emerging technology, are the people that Everett M. Rogers might term "innovators" or "early adopters" (p.169) in his seminal book *Diffusion of Innovations* (1962), in contrast to the

skepticism and reactionary conservatism of those he terms the "late majority" and the "laggards" (pp.170-171). Roger's categories, while perhaps useful at the level of individualized social capital and consumer choice, fail to provide an appropriate theoretical base from which to analyze the political nature of innovations, the inter-relationship between innovations and their boosters, and the agency and praxis which may or may not be a part of someone's decisions which result in them being categorized an obstinate laggard. Roger's framework for adoption also fails to provide the categorical space necessary to understand the disparate motivations of those who promote early adoption, for it is clear that while all members of this group share a message of urgency there in fact exists two dominant teleologies which are, strangely, quite incompatible yet decidedly symbiotic. The first Techno-Promoter subgroup I have named *e-topians* while the second, to whom I will soon return, are the *e-conomists*.

Networks of Dreams

The motives of the e-topians are in many ways noble. They dream of a world where technology has restructured society, decentralizing power and thereby allowed intellectual freedom and vocational emancipation for all who desire it:

> Social healing, it seems, approaches us from the Internet. If the hopes clustered about this miraculous, Hydra-headed gift of the information age are fulfilled, it will bring us extended democracy, personal liberation, enhanced powers of organization and coordination, renewal of community, information transmuted into wisdom, education freed from the grip of pedagogical tyranny, a new and wondrous complexity arising from chaos.
>
> (Stephen Talbott qtd. in Upitis, 1999, p.154)

Substantiating Talbott's analysis, Robert Dierker (1995) writes that the "learning process is in for change in big ways. The context will be different. The form will be different. The style will be different. The skills demanded to teach will be different. And the skills needed to learn will be

different. For better or worse, like it or not, the revolution has begun" (p.229). For Drieker, this "inevitable and profound evolution in the process of education" necessitates that the current system be "rethought from start to finish" (p.233). Drieker describes an interesting theory to back claims about the revolutionary potential of ICT. The theory posits that "the impact of a given technology is capable of being quantified by determining the extent to which that technology multiplies human capabilities to accomplish the same task" (p.228). For example, a jet traveling at 600 mph is 150 times more efficient than walking, which is performed at 4 mph. In human history, the theory goes, there has been a million multiplier only three times. The first was wire (followed by wireless) communication, the second was nuclear energy, the impact of which is still unknown, and the third is the computer, which is a "millionfold multiplication of a million multiplier" (p.229). Hence, one begins to understand where promoters of classroom technology are coming from when they claim that "we are in the midst of a momentous step in the evolution of the intellectual capacities of mankind" (p.229).

Through his books *Mindstorms* (1980) and *The Child's Machine* (1993), MIT's Seymour Papert became a potent stimulus for computer-based learning in North America. Articulating the belief that computers have/will lead to a revolution in thinking about knowledge and that "the powerful contribution of the new technologies in the enhancement of learning is the creation of personal media capable of supporting a wide range of intellectual styles" (p.ix), Papert perceives that this "megachange" (p.2) is necessitated partly for and partly by children, who across the globe "have entered a passionate and enduring love affair with the computer" (p.ix). Papert believes that this relationship with the computer will, if it hasn't already, lead many children to decreasingly "accord [the current education system] a degree of legitimation." Correspondingly, "strong feelings of dissatisfaction within society at large are rapidly making it impossible to save education as we

know it by continuing to tinker around at its edges" (p.6). Papert, advocating a "twentieth-century vision of a child as a person with the right to intellectual self-determination" (p.5), thus regards the traditional school system as irrational and unable to adapt, a bureaucratic behemoth which does not serve the function it claims, transmitting information *into* children as if they were mere vessels to be "filled." His disillusionment and contempt for traditional schooling is common among many of his associates at the Massachusetts Institute of Technology (MIT) Media Laboratory.

One notable collaborator within the MIT research group is Nicholas Negroponte (1998), who works with Papert in conceptualizing an ICT-integrated system of "small schools" that will be local, personal, and age-integrated. Connected through "learning hubs" and low earth-orbit satellites, these "New Little Red Schoolhouses" (p.2) would provide a much richer learning experience than larger, typically urban, schooling environments. Cummins and Sayers, in their book *Brave New Schools* (1995), are among a substantial—and growing—group of researchers and theorists (see Godfrey, 1971; Gardiner, 1997; Breuleux, 2001; Tapscott, 1998; Brunner and Tally, 1999; Boschmann, 1995) who share the same hope of using technology to free learners and teachers from what they perceive to be a hierarchical, antiquated, and transmission- or broadcast-oriented education paradigm. Cummins and Sayers' "aim is to understand the expanded potential of networked computing resources for enabling teachers and students to engage in the *collaborative critical inquiry* that...is crucial for preparing students for full democratic participation in their society" (p.21). This desire for a more collaborative, transactional approach to learning and/or communication is echoed by many working both within the field of education and externally in other fields such as communications and psychology (see Woodward, 1996; Maxwell and McCain, 1997; Percy, 1995; Wilden, 1980).

The overarching desire of e-topians to replace a model of education that they perceive as

Industrial Age (Negroponte, 1998) and militarised with one that fosters dialectical collaboration and intellectual liberation places them squarely within the lineage of learner-centred education, an extensive, historical body of work that, till now, has been much more concerned with deconstructing authoritarian relationships than technical solutions. John Dewey (1938), perhaps the most famous of the "progressive" education theorists, advocated learning through experience rather than the imposition of information and skills from above and without. Dewey argued that "[a]ll human experience is ultimately social...it involves contact and communication" (p.38) and that just because "all genuine education comes about through experience does not mean that all experiences are genuinely or equally educative" (p.25). With this emphasis on the "quality" of experience which encourages the learner, fosters a desire for further study, forms good habits, and is beneficial at both a moral and intellectual level, Dewey still saw an important if altered role for the teacher, or "leader of group activities" (p.59). Describing the dialectical process that was necessary if educators were to free themselves of the indoctrinating and repressive tradition of which they were a part, Dewey writes:

> there is incumbent upon the educator the duty of instituting a much more intelligent, and consequently more difficult, kind of planning. He must survey the capacities and needs of the particular set of individuals with whom he is dealing and must at the same time arrange the conditions which provide the subject-matter or content for experiences that satisfy these needs and develop those capacities. The planning must be flexible enough to permit free play for individuality of experience and yet firm enough to give direction towards continuous development of power. (p.58)

The learner- or child-centred approach exhibited in this passage has long had its proponents within established educational circles and mainstream debates, showing up for example even in such documents as the Ontario Government's internationally-known Hall-Dennis report from 1968.

Far more radical in its pedagogical and economic stance than any CMEC document, the very fact the Hall-Dennis report was published at all perhaps reflects the political climate of the day. The

late '60s paper on the aims and objectives of education condemned "[t]he society whose educational system gives priority to the economic over the spiritual and emotional needs of man defines citizens in terms of economic units and in doing so debases them" (qtd. in Sears, 2000, p.152). It argued that youth "have the right to be educated to the point where they are capable of deciding – and free to decide, on life's major issues, as they arise. That the child's impulse to grow should be trusted. That the child should be active rather than passive" (Hillen, 1999, p.16). The report denounces "fixed courses, formal subject matter, exams, external discipline, bureaucratic controls, the homogenization and regulation of the child's school day, competition, seeing the child as an economic unit and most importantly, indoctrinating or paternalistic tendencies of any sort" (Hillen, 1999, p.17). Further, the idea of failure was anathema to the collaborators of the report, who state unequivocally, "A child who is learning cannot fail" (Sears, 2000, p.152). As radical as the Hall-Dennis report and Dewey and others seem when compared to the status quo, they are not the most radical voices influencing e-topian thinking.

When Seymour Paper stated in 1984 that "[t]here won't be schools in the future...I think the computer will blow up the school" (in Cuban, 1986, p.72) there is indication that the e-topian position is tied to other, more extreme positions. This distrust and loathing of the school "system," of organization, of structure in general, is in many ways a postmodern[2] position, a rejection of Western values of enlightenment and science, "suspicious of classical notions of truth, reason, identity and objectivity, of the idea of universal progress or emancipation, of single frameworks, grand narratives or ultimate grounds of explanation" (Eagleton, 1996, p.vii). Gianni Vattimo, in his

[2] I use postmodern here to describe a belief system, a *Weltanshauung*, where ideas of chaos, play, decenteredness, irony, plurality, representation, the "Other," and difference bound and rebound through the dominant discourse, contradicting, complementing, but always problematizing and deconstructing.

book *The Transparent Society* (1992), rejects any notion of linearity or final destination, writing that "if human events do not make up a unilinear continuum, then one cannot regard them as proceeding towards an end, realizing a rational programme of improvement, education and emancipation" (p.3). Emancipation and liberation are approachable, then, only through disorientation, the liberation of differences and local elements, and the end of hierarchies built on the Enlightenment's violent and myth-creating metaphysics.

These postmodern sensibilities have been carried into the realm of education by, among many others, Ivan Illich, who writes in his book *Deschooling Society* (1970) that:

> Many students, especially those who are poor, intuitively know what the schools do for them. They school them to confuse process and substance...The pupil is thereby "schooled" to confuse teaching with learning, grade advancement with education, a diploma with competence, and fluency with the ability to say something new. His imagination is "schooled" to accept service in place of value. (p.1)

Railing against "obligatory" schooling, Illich feels that organized education is as destructive to democracy and freedom as the escalation of weapons and that "it is intellectually emasculating, socially polarizing, and destructive of the credibility of the political system which promotes it" (p.12). That schooling is a form of social control is a theory that can also be found in more Marxist-oriented work such as Lloyd and Thomas' *Culture and the State* (1998) where they argue, not unlike Illich, that the development of mandatory schooling has from the start been about authority, power, and producing a manageable population. A hegemonic tool of the modern state, the education system is then ideologically totalizing and "defines the function of the teacher as ethical tutor and as exemplary figure through whom the internalization of normative values in the child is facilitated" (p.17).

The authors argue that the state must operate through hegemony in order to win "active assent" to a system of governance—liberal democracy—which simultaneously offers the hope of

individual freedom and substantive rights while systematically repressing these potentialities through abstract notions of "formal universality." In order to maintain unity within such a paradoxical state, the state need not resort to totalitarian control, rather: "[t]he subject of ideology is formed not in 'wholeness,' but in the displacement and occlusion of its multiple possibilities. The primary, though not the only, mechanism of that displacement is for us the classroom, its primary agent, the teacher" (pp.21-22). Schools are not then teaching civics per se, rather they interpellate the young as members in a very specific "public world of the political" (p.20) where the state can take an almost paternalistic, ethical-pedagogical role and the individual is happy to be represented as such. For Lloyd and Thomas, like Antonio Gramsci from whom they base much of their theorizing, schools are fully implicated in the negative and conservative process of maintaining social hierarchy, disciplining the oppositional tendencies of 'subaltern' classes, and indoctrinating students into an ideology which does not and can never benefit the majority of them who are working class.

While sharing in the idea of freedom and an aversion to coerced behavior, and in a condemnation of schools as sites of indoctrination and homogenization, the ideological tendencies of e-topians are oriented much more towards libertarianism, the most extreme form of minimal government and individual choice, rather than radical socialism and its drive for collective equality. Through technology e-topians foresee a breakdown of normatizing, anachronistic boundaries and the pluralization and democratization of not only education but the wider social milieu. Whereas e-topians highlight plurality, democracy, and the breakdown of repressive systems in their vision of a "knowledge society," the e-conomist vision to which we now turn places emphasis squarely on questions of how technology can facilitate and expand the "knowledge economy."

Networks for Trade

Deregulation, dezoning, dissagregation, devolution (Dei and Karumanchery, 1999)[3] privatization, and competition (Sears, 2000; Kuehn, 1996): these neoliberal imperatives form the lens through which the e-conomists evaluate technology's potential to the education system. Their logic is fairly simple: information and communication technology (ICT) are almost ubiquitous in the world of business and should therefore become equally ubiquitous in education. Deeply concerned with systemic efficiency and yielding "productive" adults (Dede, 2000, p.171), the e-conomist position considers the national and global economies the key factor in individual and societal well-being and thus the education system must ensure youth are well-trained and fully skilled (Graham, 1997; Dede, 2000). In reality, few individual reformers or academics will advocate reforms that shift Canada's public education system to a total market-orientation. The hard-neoliberal position is usually articulated through lobby groups and organizations (Robertson, 1998) such as the C.D. Howe Institute (p.38), the Fraser Institute (p.38), the Business Council on National Issues (p.85), transnational education management organizations (p.244), and the Organization of Economic Co-operation and Development (p.75), to name just a few. One group, the Canadian E-Business Opportunities Roundtable, which was co-chaired by ex-Nortel CEO John Roth, promotes online business as the road to prosperity and has urged the government to "improve Internet literacy by making [an] International Computer Driving License a prerequisite for secondary and postsecondary graduation" (qtd. in Nikiforuk, 2000, p.12). Why the impulse for rapid reform? Where do the concepts come from that business leaders and e-conomists base their rationale?

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[3] *Devolution* refers to spending cuts and the decentralization of responsibility while centralizing curriculum and testing. *Deregulation* specifies the policy shift to "eradicate" constraints on the market (in education this would be teacher unions, trustees, and restrictions on corporate involvement). *Dezoning* removes major structural barriers, thereby allowing wealthier parents to move their children wherever they wanted. *Disaggregation* is the movement away from notions of community and the public good and towards the ideals of the market like competition and

One source is the well-known Peter Drucker, who fifty years ago coined the phrase "knowledge workers" and who claims (1994) that a country's comparative advantage now lies not with low wages but with the application of knowledge to such activities as lean manufacturing and just-in-time delivery. He thus puts great emphasis on "formal" education which:

> will become the center of the knowledge society, and the school its key institution. What knowledge must everybody have? What is 'quality' in learning and teaching? These will of necessity become central concerns of the knowledge society, and central political issues. In fact, the acquisition and distribution of formal knowledge may come to occupy the place in the politics of the knowledge society which the acquisition and distribution of property and income have occupied in our politics over the two or three centuries that we have come to call the Age of Capitalism. (p.66)

While Drucker claims that social and economic power will be wide open, that we live in a new "age of social transformation" (p.80), and that life-long learning will free people from linear models of learning and credentialism, that learning "will become the tool of the individual— available to him or her at any age—if only because so much skill and knowledge can be acquired by means of the new learning technologies" (p.67), he nevertheless finishes his thoughts on education with a return to the primacy of market criterion. Drucker advises that before public or corporate policy is enacted, there first needs to be a "competitive-impact statement" (p.77) similar to environmental-impact statements that currently exist for corporations or public works. Anything and everything, including education, would be subject to such an analysis, for "a country's competitive position in the world economy—and also an industry's and an organization's—has to be the first consideration in its domestic policies and strategies" (p.77). In rethinking education, to take its place at the centre of the emerging knowledge society, Drucker asserts that we "will have to learn to define the quality of education and the productivity of education, to measure both and to manage both" (p.80).

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rationale self-interest.

Theories like Drucker's have been amplified throughout the mainstream media (Armstrong and Casement, 1998) and by numerous other theorists (see Shaffer, 2000; Dede, 2000) including Don Tapscott (1998) who, while something of an e-topian in the way he imagines digital technology should be implemented into classrooms, nevertheless makes a number of important claims about the future of schools and the knowledge economy. He predicts a future where work and learning will be one in the same, where workers will have to constantly reinvent their knowledge base and forget about a career plan, where corporations will increasingly open their own accredited universities to both update their workers' skills and turn a profit, where "[y]our company can compete only if it can learn faster than its competitors" (p.198), and where the "new media will transform education, creating a working-learning infostructure for the digital economy (p.204). This preoccupation with the needs of the knowledge-based economy has also been internalized by the Government of Canada, who perceive Industry Canada's SchoolNet as an integral part of keeping "Canada among the leaders in connecting its citizens to the Internet. In an increasingly competitive and knowledge-based economy, Canada can benefit by becoming a world leader in the development and use of advanced information and communication technologies" (<www.schoolnet.ca>).

MIDDLE GROUND: The Techno-Pragmatists

David Graham (1997), though a technological enthusiast through-and-through, is somewhat problematic in terms of categorization. He, like the Techno-Promoters, presumes that having a personal computer on the desk of every student is beneficial for both the individual student, the school system and the economy. Graham looks upon software as the imparter of facts, needing to "become as close to human as possible" (p.13) because, after all, the programs are "the true colleagues of the teacher" (p.14). However, Graham steps off the beaten path of most Techno-

Promoters when he begins to ask questions about the cost of computers in education, their accelerating obsolescence, the lack of appropriate software, the potential impact on society, and whether ICT can find an "environmentally friendly" place in the larger curriculum. Despite the fact that Graham finds all barriers and problems with computers in classroom ultimately solvable, his very asking of these questions leads us through a door into a more reflective world:

> There is too much mindless genuflecting at the altars we have erected to computers, without any real thought to the true depths of their impact and or to the breadth of their potential influence on future generations. There is also little thought to the potential (and even realized) areas of negative impact these new "idols" can bring with them. We have a new apple, have we really examined the implications of taking our first bites? (p.14)

Graham, then, represents the optimistic tendencies within what I call the Techno-Pragmatists, a heterogenous group who examines ICT-use in education from a more reflective standpoint than the Techno-Promoters. They are the largest group of the three, an amalgam of individuals and groups who seek to navigate their way through sometimes vicious ideo-storms and the torrent of often contradictory messages from the media. In many ways, this is the group of individuals in society who make what Stuart Hall calls "negotiated" decodings/readings of the dominant paradigm (Fiske, 1990, p.111), or who Rogers (1962) named the "early" and "late" majority when describing the adoption of new ideas. In many ways, this group shares traits with small "l" liberals: critical but not too critical, cognizant of economic necessity but not dogmatically so, affected by social pressure but not drones, concerned with equity but also individual freedom, possessors of a social conscience but not a strong attachment to socialist programs. In other words, the bulk of the population living in Westernized countries.

The Techno-Dissidents

If Graham tends towards the technophilic edge of the middle ground, those Techno-Pragmatists who stand at the opposite end of the category, what might be called the heretic fringe, form a continuum straight into a world of deeply critical thinkers, technophiles, neo-Luddites, neo-Marxists, anarchists, and others who find in technology and technological reverence the seeds of moral deterioration, negative social engineering, repression, cultural homogenization, rabid neoliberalism, and/or even fascism. The diverse voices from this group[4] choose not to participate in the songs of progress, they instead make a conscious decision to stand on the outside of the dominant ideology looking in. Some are moderate advocates of learner-centred approaches, others exhibit a familiar conservatism, others still are as much ideologues as many of the e-topians and e-conomists, but what they all seem to share is a desire to initiate dialogue and halt the rush to enact technophilic policies. Jane Healy, author of *Failure to Connect: How Computers Affect Our Children's Minds—for Better and Worse* (1998), believes that "[t]oday's children are the subjects of a vast and optimistic experiment...[that is]...well financed and enthusiastically supported by major corporations, the public at large, and government officials around the world" (p.17). In attempting to explain this push for computers in the classroom, William Ruckeyser, of the non-profit Learning in the Real World, says, "The nearest thing I can draw a parallel to is a theological discussion. There's so much an element of faith here that demanding evidence is almost a sign of heresy" (qtd. in Healy, 1998, p.19).

[4] See, for example, Cuban (2001), Robertson (1998), Aronowitz & Giroux (1985), Healy (1998), Roszak (1994), Upitis (1999), Postman (1995), Shenk (1999), Franklin (1999), and Armstrong & Casement (1998).

PART II – Breaking Down the Rhetoric

Revisiting the CMEC

Halting for a moment the literary exploration of the Techno-Dissidents, let us return to the CMEC and its "elements of faith," its assumptions about technology and education and economics, to which we can then apply and appraise many of the theories for and against a tighter link between technology and education. In light of the literature presented thus far, the CMEC clearly walks in two technophilic worlds. Their argument, summarized from the citations presented earlier, is this: first, ICT in the classroom and in the school will inevitably lead to the positive outcome of a more individualized, learner-centred system freed from the gate-keeping and centralized control inherent to traditional public education and, second, increased use and comfort with technology is linked absolutely with personal, regional, and national economic competitiveness in a globalized "Knowledge Economy" and, therefore, increased material wealth and human happiness. The rhetorical position of the CMEC demands three separate but ultimately interwoven investigations: 1) are the benefits of ICTs in classrooms beyond question and will their adoption determine a learner-centred system; 2) is the CMEC committed in deed as in word to this learner-centred transformation of the public education system in Canada; and 3) how valid are the CMEC's assumptions concerning the existence and virtue of a knowledge society/economy (ie. can ICTs in schools positively affect the economy and more tightly link work and school without negatively impacting on civil society, democracy, cultural diversity, individuality, et cetera)?

Deconstructing the Assumed Relationship Between Technology and Learner-Centred Public Education

The presumption, first, that the benefits of technology in education are self-evident and substantially confirmed and, second, that ICTs will indubitably shift education towards a learner-centred approach has been and is challenged on a number of fronts. Trying to keep up with both the pace of implementation and velocity of technical changes, recent quantitative and qualitative research has been attacked by many frustrated educational critics as impatient and inconclusive. According to these critics, researchers are beginning to realize how difficult it is to quantify the type of learning that technology best enhances (Wellburn, 1996) and that, without proper teacher training and implementation policies, "the results of introducing computer and new technologies into education is highly ambiguous" (Kellner, 2001, p.68). Jane Healy (1998), in reviewing the literature, is disheartened by the partisan nature of most technological studies. She finds that the "few studies showing positive results for educational technology have been largely funded by computer corporations or conducted by educators who are (or would like to become) consultants for the technology business...the fact is that we still await objective validation of benefits from educational computing" (p.22). Jamieson McKenzie (qtd. in Wellburn, 1996) finds that most substantial research into the usefulness of technology for education has focussed too much on performance at lower order tasks and basic skills. Edward Miller, former editor of the Harvard Education Letter, goes one step further than Healy and McKenzie when he writes that, "The research is set up in a way to find benefits that aren't really there. Most knowledgeable people agree that most of the research isn't valid... Essentially, it's just worthless" (qtd. in Healy, 1998, p.19). Healy identifies four "fatal flaws" with current research: 1) studies cover too short a time span; 2) quality or type of software is not well controlled; 3) tests, usually standardized, measure only a

limited, narrow skill set along a broad continuum; and 4) the failure to control for the *teacher variable*. This fourth criticism is paralleled and extended by Rena Upitis' (1999) view that "[g]ood teachers will do good things with computers, and computers will not help poor teachers teach better. But good teachers will also teach well without computers" (p.163).

A study by none other than Apple Computer has found that it takes, on average, between five and six years before teachers change their method so that they are employing computers in such a way as to benefit students (Armstrong & Casement, 1998), a conclusion which in many ways supports Larry Cuban's (1986) description of the relationship between teachers and technology as a "fickle romance" (p.4). The delay in adoption by teachers could be attributed to an absence of training, a lack of affordable and user-friendly software, it could reflect a bias on the part researchers in defining "beneficial" (this is an unlikely option, considering the study was commissioned by a technology-manufacturing corporation), or it could be a generational lag of teachers who didn't grow up using and don't trust computers. This last option is claimed by the CMEC, yet it is too easy and too simplistic an answer. Teachers have historically been denounced by educational reformers who, according to Cuban (1986), have never really appreciated the tension between continuity and change experienced by those working *in* the classroom. Like Healy, Cuban notes that too often teachers are mechanistically factored out of the education equation, written off as almost irrelevant dinosaurs standing in the way of technology's benefits, and their humanness—their feelings, their goals, their desire and ability to teach children—is ignored. Could it happen that benefits of teacher-student interaction, such as compassion, commitment, respect, negotiation, and discovery, are ignored by technophiles who fixate on potential negative qualities like intolerance, repression, conformity, and, questionably, inefficiency?

Armstrong and Casement (1998) argue that computers are a visual medium, dealing in

images, and that youngsters need instead "to be oriented to the world around them, with its sights, sounds, smells, tastes, and textures" (p.16). The authors feel the iconic and sanitized world of computers cannot cultivate the emotional and intellectual bonds that are necessary between a child and those helping them learn. Interestingly, both Jane Healy and Sherry Turkle, an associate of Seymour Papert's at MIT, describe similar situations involving a socially awkward, troubled young boy whose computer use far exceeds the norm. Turkle sees the computer use of her subject as a positive, allowing her subject to relax, be in control, and form a relationship where the young boy could form none with other children (Cuban, 1986). Illuminating the pessimism at the other end of the spectrum from Turkle's optimism, Healy (1998) considers the computer not a solution for social outcasts but as one of the contributing factors for their maladjustment to life within human groups. In the case of her subject, she finds her boy bright but in a strange way, unable to connect concepts and ideas to each and unable to relate with other human beings, qualities not unlike autism though the boy does not suffer from the condition. Healy's explanation of the boy's condition emerges from her understanding of how the human brain works:

> The brain undergoes certain "critical" or "sensitive" periods in both childhood and adolescence when learning environments exert special kinds of effects and when certain types of activities and stimulation are most appropriate and necessary to maximize mental potential. By providing the proper kind of experience at different ages, we help shape not only the intelligence of brains, but also children's "habits of mind" for a lifetime. (p.27)

Healy, in her book *Failure to Connect* (1998), goes into great depth about brain development, educational software, video games, and the importance of human interaction and community. She advises extreme caution and, although the "human brain has survived and flourished because its plasticity enables it to adapt in wondrous ways to changing environments" (p.167), allowing computers to replace our "intellectual value systems" (p. 167) is unacceptable. Healy concludes by warning that "[j]ust because children—particularly young ones—are performing tasks that look

technologically sophisticated does not mean they are learning anything important" (p.27).

Further to the critique of the CMEC's assumptions about technology, when the organization claims that "[n]ew technologies will transform the classroom since they encourage fundamentally different forms of interaction among students and teachers" can it be concluded without question that such use will "engage students systematically in higher-order cognitive tasks, and prompt teachers to question old assumptions about instruction" (CMEC, 1997b, p.13)? It is widely agreed that technologies *do* alter human interaction, that they do alter how we approach each other and the world around us , but it is far from agreed upon *how* they alter our social world and to what degree such changes—small or large—are determined. Technology has been referred to as both the "dominant organizer" (Gradwell, 1999, p.241) and "profoundly transformational" (Castells, 1996). For Neil Postman (1995), new technologies indeed have an internal logic which guides their integration into a given culture. Postman believes that no technology is ever all good or all bad and that present-day digital technologies, "like all important technologies of the past, [are] Faustian bargains, giving and taking away, sometimes in equal measure, sometimes more in one way than the other" (p.41).

As with Harold Innis who wrote about the 'bias of communication' and Marshall McLuhan, who's aphorism 'the medium is the message' generates strong reactions to this day, Postman sees a bias or "powerful idea" inherent in each new invention:

> a technology predisposes us to favor and value certain perspectives and accomplishments and to subordinate others. Every technology has a philosophy, which is given expression in how the technology makes people use their minds, in what it makes us do with our bodies, in how it codifies the world, in which of our senses it amplifies, in which of our emotional and intellectual tendencies it disregards. (p. 192)

From this, Postman concludes that different technologies have different intellectual, emotional, political, sensory, social, and content biases. Thus, technological change is not "additive," it does

not merely affix itself to what already exists, "it changes everything" (p.192). At times, it seems that Postman articulates a theory which Langdon Winner describes as "autonomous technology." Winner finds such views of technology transdisciplinary and strong, both in the current and historical context. Using "autonomous technology" to refer to "all conceptions and observations to the effect that technology is somehow out of the control of human agency" (p.15), Winner paraphrases the argument by those who consider technology autonomous:

> At the outset, the development of all technologies reflects the highest attributes of human intelligence, inventiveness, and concern. But beyond a certain point, the point at which the efficacy of the technology becomes evident, these qualities begin to have less and less influence upon the final outcome; intelligence, inventiveness, and concern effectively cease to have any real impact on the ways in which technology shapes the world...Here it happens that men release powerful changes into the world with cavalier disregard for consequences (p.313).

If Postman wavers at times on the edge of this way of thinking, his conclusions advocating action and resiliency position him back in a theoretical world where citizens can make choices about the use and direction of technology.

Postman's message of limited human intervention is shared by writers like Manuel Castells (1996; see also Philip Haywood, 1990) who acknowledge that, while the revolution in ICT has diffused through all parts of our lives, citizens still have some control. Castells stresses that this:

> multidimensional transformation is not technologically determined. Rather, it is the outcome of an interactive process between technology, economic strategies, social interests, cultural values, and power struggles. Thus, in principle, new social and spatial structures resulting from this multilayered process of change can be modified by social action, private strategies, and public policies. (p.1)

Paul Levinson (1997), another theorist who rejects the idea of autonomous technology, does not

disagree that different technologies make some things possible, but he does take issue with claims that a given technology will "inevitably and unalterably" lead, or determine, a certain result. Levinson believes in what he calls "soft" determinism, where technology will offer up possibilites and human beings turn that possibility into reality, and technology does not of itself "change everything." Leading him away from hard determinism is Levinson's commitment to the human capacity for rational, deliberate decisions and planning. Further eroding any attachment to hard determinism is his firm belief that inherent to every innovation are a multitude of unintended consequences. Just as Alexander Graham Bell invented the telephone while trying to build a hearing aid for his wife, and Thomas Edison believed his phonograph would be used primarily to record conversations on that telephone, so many inventions have ended up performing functions never imagined by their developers. The second major thrust of Levinson's analysis involves the idea of remediation, that is, a great percentage of innovation corrects some fault or shortcoming that existed in an older technology. An example he offers is the VCR, which formed a symbiotic and remedial relationship with the television and its ephemeral content. The computer, to which we will return shortly, offers an example of both unintended consequences and frenzied remediation.

The CMEC exhibits a form of hard determinism in its contention that as ICT use escalates "[l]earning becomes separated from time (schedules, hours of schooling as a measure of achievement) and place (classrooms, schools, and universities)" and thus "students take greater responsibility for assessing themselves, the pace of learning changes and becomes more individualized" (1997b, p.13). It is a truism that current ICTs have drastically altered human perception and control over space and time, that he primary quality which makes emerging digital technologies so revolutionary for information and human interaction is the ability to remove spatial barriers while managing to ensure the survival of artifacts. In other words, past technologies were

usually either space-binding or time-binding, not both, they either made information easier to move spatially but temporary (telegraph, papyrus) or permanent but much less mobile (totem poles, clay tablets). Now, with a number of technologies converging, or undergoing 'remediation', there exists the possibility to both safeguard and transport information in ways that were previously only dreamt about (Levinson, 1997; Postman, 1992). This doesn't mean that learning will be divorced from space and time, as the CMEC implies, only that it is possible. Additionally, the CMEC makes no mention of the profound consequences for a Western world that places great emphasis on the storage of knowledge, the development of that knowledge into canons, and the subsequent imparting of such canons to youth. What are the unintended consequences of freeing education from time and place, of shifting the burden and pace of information gathering and education more to the student? The CMEC and the E-topians have clearly outlined the potential benefits of technology with regards to learn-centred education, but these are not a given. What of the dangers, what lies beyond the electronic euphoria?

For anyone concerned with societal trends and, more specifically, public education, the speed and volume with which ICTs deal with information is an urgent matter. In the same way that Theodore Roszak (1994) laments what he calls "data glut" and David Shenk (1997) warns about the dangers of "data smog," Armstrong and Casement (1998) charge that "[e]lectronic technology does not allow breathing space for the mind. Instead, it induces a kind of mental congestion" (p.13). Supported by numerous other Techno-Dissidents (see Healy, 1998; Postman, 1995; Schenk, 1999; Cuban, 1986), Armstrong and Casement write:

> Computer use changes perceptions in a radically different way from print, one that is in many respects diametrically opposed to the effects of the older technology. Unlike print, which encourages reflection and careful consideration of various points of view, computer software urges immediate action...Speed and control are emphasized at the expense of thoughtfulness and understanding. (1998, p.15)

Put in a somewhat different context, "One of the great dangers of equating knowledge with information is that knowledge is trivialized in the process" (Upitis, 1999, p.165). Armstrong and Casement (1998) find it ironic that the very technology so many "champion" as the medium that will enhance students' thinking may very well be responsible for exactly the opposite result:

> Children are not being spared the effects of the accelerating treadmill we have constructed for ourselves. In schools, if not in homes, we appear to be creating an environment that mirrors the fast-paced adult world, in which time, productivity, and instant communication are of the essence. (p.18)

The postmodernist Jean-Francois Lyotard articulates the essence of this line of criticism when he writes that in "a world in which success is identified with saving time, thinking has one, irremediable fault: it wastes time" (qtd. in Connor, 1997, p.42).

The point being made here is not that such critical views of technology are correct, for much of the Techno-Dissent displayed exhibits its own tendency towards determinism if not compulsive cynicism and I shall return later to examine them in more depth. The point being made is that they are valid concerns, real possibilities among many, and that they are by and large ignored by the CMEC. The organization's optimistic rhetoric promoting learner-centred education through technology, though admirable in many ways, appears almost wilfully naive and simplistic. Let us remind ourselves again that, as Postman, Healy, Levinson and others point out, technology in schools can have very different outcomes depending on the choices made by government policy-makers, school administrators, teachers, parents, and even students themselves. The idea of learner-centred education existed prior to current ICTs, and is in all respects an independent philosophy. The only thing we can say for certain is that it remains to be seen what technology's impact will be on the structure and future of public schooling, on place and time, and on the thinking processes of young people. Principles of rhetorical analysis guide us from the words contained in the documents

back to the source and back to the second of our three questions: is the CMEC committed in deed as in word to a learner-centred transformation of the public education system in Canada?

Actions Speak Louder Than Words

On playgrounds across North America, you can hear children calling one another's bluff, "Hey, you talk it, but do you walk it?" This challenge, this implicit test of integrity and honour, must be applied to the CMEC if we are to place any faith in their stated commitment to a more learner-centred education system and, necessary to this result, the thoughtful and beneficial implementation of technology. Let me start this section with what at first-glance seems to be a common sensical assumption, an assumption articulated by the CMEC itself: the great majority of parents, politicians, business leaders, educators, students, and those generally concerned with education all advocate a shift towards a more learner-centred education system. Who really would be against students learning more at their own pace, against working on projects that both educated *and* interested them, against allowing teachers to lecture less and work with students at a more individual level, or against encouraging students to take more responsibility for their own education. Of course, the degree to which the education system adopts learner-centred principles is a major source of debate, but if we are to accept the rhetoric of the CMEC the direction of the shift appears almost without challenge. The result of any shift towards learner-centred education, however great or small, would, as the CMEC makes clear, demand and result in less standardization, less centralization, and, generally, less external control across the system as a whole (again, we are talking about direction not degree, shifts not idealistic ends). Yet the current tack within public education systems across Canada, led by the Ministers who make up the CMEC, is towards standardization and centralization and the Council, as the "voice of education in Canada," has been

very much at the forefront of these trends.

As discussed earlier, the CMEC's only substantive initiatives to date have been the School Achievement Indicator Program (SAIP) and the Pan-Canadian Protocol for Collaboration on School Curriculum which has so far produced the "The Common Framework of Science Learning Outcomes: K to 12." The former administers centralized and standardized tests to students across the country while the latter establishes a nation-wide canon deemed necessary for scientific literacy. At a superficial level, neither of these ventures appear as anything more than attempts to raise the standards of education, ensure accountability, enable teacher and student mobility, and hopefully make the education process more efficient. However, as we have heard, no new innovation is all good or all bad and each must face the possibility of unintended consequences. For standardized, centralized tests and curriculums, those potential unintended consequences take a number of less than desirable forms.

The first negative repercussion of standardization and centralization is the sense of disempowerment it can leave within the ranks of teachers. To many, standardization means that governments and their education ministries are attempting to create a "teacher-proof curriculum" (Mattys, 2000, p.11), deskilling teachers and creating "a nondialectical separation of conception from execution and effectively reduc[ing] teachers to the status of technicians or state-sponsored functionaries" (Giroux & McLaren, 1989, p.xvi). In other words,

> [the] call for more curricular content and increased standardized testing is a thinly disguised attempt to impose cultural uniformity on the schools, to make school content irrelevant to the culturally specific traditions, experiences, and histories the students bring to schools, and to deskill teachers by forcing them to concentrate on delivering a curriculum that is both prepackaged and intellectually vapid. (Giroux & McLaren, 1989, p.xviii)

While the position of Giroux and McLaren is admittedly radical, they do make manifest the reaction of many teachers to the heavy-handed way that standardization and centralization have been

implemented. One lesson that might be interpreted from such measures is that teachers are incapable of following more general guidelines and must be led by the ear through the curriculum. The CMEC's (1997a) disparaging claim that general educational results are falling far below social expectations and that schools are providing students' with inadequate training is contested statistically by Robertson (1998) and Livingstone (1998) but is also critiqued by Mattys (2000) from a psychological standpoint. For Mattys, the logical conclusion of vilifying schools and those working in them is that as "teachers lose more autonomy, as teachers become increasingly constrained by political agendas, the teaching profession will undoubtedly lose its most qualified teachers" (p.11). In other words, claims like that made by the CMEC become a self-fulfilling prophecy, leading to lower morale, a worsening of the pedagogical environment, and the exodus of the best and brightest teachers.

A second major problem of standardization and centralization is that, as curriculums become more and more homogenous, the balance between competition and an individualized learning pace is thrown off. With schools, municipalities, regions, provinces and nations rushing to compare their schools' results, teachers and administrators fight to keep their students (and themselves) competitive with top schools, thereby preventing their school and its students from looking "inadequate" when 'raw'[5] scores are compared. Almost inevitably there is 'coaching', where "what is assessed becomes what is valued, which becomes what is taught" (McEwen, 1995, p.42). A multitude of studies have critically addressed standardized testing, some problematizing the link between improved test scores and actual learning while others have pointed out "standardized tests' narrowness of content, their lack of match with curricula and instruction, their neglect of higher-

[5] 'Raw' scores can often be misleading, not taking into account socio-economic factors nor other issues like language and levels of students new to Canada (Couture & Cheng, 2000).

order thinking skills, and the limited relevance and meaningfulness of their multiple-choice formats" (Couture & Cheng, 2000, p.68). Although official tests may only be administered in certain grades, as with the SAIP, the testing culture nevertheless becomes entrenched and gradually educators begin to "teach to the test" to avoid having their students fall behind.

It should be noted that the CMEC is not alone in its drive towards increased testing and common curriculums, it simply is following global trends (Gidney, 1999). Educational bureaucrats in countries around the world have long been fostering this "culture of performance" (Couture & Cheng, 2000) through their emphasis on measurement, often compulsively comparing results no matter how different cultures or systems might be (Robertson, 1998). One cannot say that, just because there is standardized testing and centralized curriculum, teachers will stop trying and simply administer practice test after practice test. But what can be said is that the CMEC, by setting the tone at a national level, has increased the pressure on teachers to align themselves with the demands of the SAIP and the Common Framework, as well as the abundance of more regional and provincial standardized tests. Certainly, the CMEC is not helping build the context necessary for the shift to more learner-centred education systems in Canada. Ironically, one of the Council's own documents published on its website illuminates the paradoxical environment that is being created for teachers:

> Advances in pedagogy are not always understood or appreciated by those outside the educational milieu[...]. It is discouraging to many teachers to think that some members of the public may be demanding instruction that meets such educational goals as independent learning, critical and creative thinking, and the development of personal and social skills, while also asking teachers to use traditional measure incompatible with those goals. (1996, p.16)

The progressive rhetoric of the Council emerges as, literally and figuratively, paper thin. The CMEC documents on technology and education read as wonderful blends between the needs of children, the needs of society, the needs of government, and the needs of the economy, yet such

promise of balance is neutralized by the Council's myopic and lopsided philosophical commitment.

Business as Usual

Just as the preoccupation with vocation and skills drove the creation of public schools in 19th century Toronto, the needs of business and political and financial elites continue to have the lion's share of influence on the educational agenda in Canada. The push for national and regional governments to respond to economic interpenetration, or globalization, has been strong, whether it be from multi-nationals, workers, or, in the case of education, parents and administrators worried about students' employment and financial futures. When one hears about the "crisis" in education, which the CMEC refers to and implies often, what is often meant is that schools are no longer preparing students adequately for an altered job market. The rationale for many is that the nature of work itself has changed, that it has shifted away from routinized physical labour to, as Peter Drucker described earlier, work that depends on the retention and application of knowledge. The idea of the knowledge society, founded on a knowledge economy where work and learning are supposedly becoming the same thing (Tapscott, 1996), has been adopted almost without question by the CMEC. The Council, in explaining its claim that the "knowledge society is on the rise" (1997a, p.2), writes:

> With the world trade globalization concept prevailing, territories, provinces and countries realize that they simply cannot wait for the development of their natural and social resources. Each entity must now count more than ever on its better informed human strength for the management of its natural resources and in the participation of a well-balanced economic growth. Education supported by its new information and communications technologies, will become the tool of choice to face the problems created by the expansion of trade and the various human needs of the nation. (1997a, p.2)

According to the CMEC, these trends mean that "[i]ndividuals' higher needs and the demands of the workplace are converging" (1997a, p.2). No longer will education be the domain of philosophers and humanist psychologists and educators. Instead:

> [a]s new technologies develop and expand all over the world, it follows that the demand for individuals with higher-order thinking and technical skills will increase...Since fewer people are needed on the assembly line – the industrial model of excellence throughout the 20th century – the talk is more toward promoting the individual's capacity for autonomy, higher-thinking, creativity, problem-solving and collaborative skills. For instance, these individuals are sought often by the revamped industry, which wants them for project-based work activities, and other highly demanding tasks and responsibilities. (1997a, pp.2-3)

The assumptions are, then, that in the knowledge economy there will be 1) a vastly increased demand for highly educated workers, and 2) the relationship between increased education and increased earnings will apply not only to individuals but to societies as well (Livingstone, 1999; Neill, 1995).

The preeminence of neoliberal values among those directing educational change is exhibited not only above in the acceptance and assumptions concerning globalization, free trade, and the knowledge economy, it is exhibited also within the educational lexicon, where bureaucrats have begun speaking of teachers as "front-line service providers" who need to be more accountable to students and parents, who are their "clients" and "customers" (Gidney, 1999, p.236) and who are attempting to expand their or their child's "human capital" (Livingstone, 1999; Aronowitz & Giroux, 1985). Not only has the language of capitalism penetrated school walls, but the tools used to measure "success" have also been adopted by educational administrators. Just as many Western governments have moved to cut spending, increase efficiency, and look for ways to make themselves "lean" (Sears, 2000), schools are more and more being held to market criteria. Success, across much of the public educational landscape, has come to mean graduating students with "marketable" skills, students who have been weaned on a diet of competition and career goals (Aronowitz & Giroux, 1985). The drive for accountability and cost-effectiveness is spelled out clearly in the CMEC documents noted above, as when the Council acknowledges that the "individual is challenged to give more of him or herself – and to face the downside of these

demands" (1997a, p.3). The acceptance, if not the celebration, of competition, the chance for more wealth, a reduction in security, and compulsory mobility are spelled out clearly, yes. Unchallenged? No.

The very idea that we are moving into a knowledge society, where workers will think and create and feel empowered, is denounced by a host of critics as an intentional misrepresentation, something of a red herring, allowing a rich minority within the capitalist system to distract the public from the real nature of the changes occurring. In his book, *The Education-Jobs Gap: Underemployment or Economic Democracy*, D.W. Livingstone (1999) argues that individuals continually learn much more practical *and* theoretical knowledge in school than we ever have the chance to apply in paid workplaces. Further, he argues that it is deceptive and detrimental for business leaders, education bureaucrats, politicians, and the media to claim there exists a skills shortage when the real problem is the organization of the economy. Livingstone goes on to argue that all the promises and hoopla over the so-called "Knowledge Economy" are not coming to fruition. For most of the economy, it is just business—literally—as usual, where "[w]orking class jobs with narrow technical task requirements and very limited social authority continue to constitute the numerically predominant class position" (161). According to his analysis of prevailing trends, Livingstone concludes that structural unemployment, involuntary reduced labour, and chronic underemployment will characterize the near future and that those pushing the corporate agenda will continue to scapegoat the education system in times of financial crisis[6]. Livingstone sees an underhanded motive for such scapegoating, namely the desire among market winners for a large

[6] See also M. Burke and J. Shields (1999), *The Job-Poor Recovery : social cohesion and the Canadian labour market.*

reserve army of labour to hold down wages and employee expectations.

In the same vein, a wide number of education critics consider the job-skill crisis in education merely a fabrication, a misrepresentation of what the education system is or is not doing. For Barlow and Robertson, in their book *Class Warfare* (1994), the "crisis" is a tool of the Right, used to undermine the "traditional" function of public schooling (educating for democracy) and thus make neoliberal restructuring easier. Aronowitz and Giroux (1984) put it this way: "In our judgment, the new public philosophy, with its celebration of economic and technocratic reason, begins with the wrong problems; furthermore, it misrepresents the problems it endorses and, in doing so, advocates the wrong solutions" (200). Barlow and Robertson set out the central myths used by the Right in order to reorganize the foundation of public education: Myth #1 — "Our schools have failed us...and our kids"; Myth #2 — "Our graduates just don't have the skills"; and Myth #3 — "Big business is creating highly skilled jobs" (1994, p.28). Like Livingstone, Barlow and Robertson painstakingly examine and debunk each of these myths, showing how neoliberal/neoconservative reformers make irresponsible comparisons between nation's student test scores and funding structures to further their own agenda, how a liberal education has been successful in keeping Canada's students among the most world's most skilled, and how the majority of the jobs being created in the knowledge economy are simple service-oriented "McJobs" (Robertson and Barlow, 1994).

A great many critics feel, or fear, that jobs in the coming years will not be of higher quality, rather a great number of jobs will be characterized by a heightened pace but continued tedium and that education will increasingly mirror these changes. They believe the consequences of "lean production" (Sears, 2000, p.146), or "fast capitalism" (Couture & Cheng, 2000, p.66), are and will be transferred into the classroom, exacerbated by the speed of information delivered by ICTs, and

will lead to a culture of performance which tightly links resources and outputs, employs surveillance as an incentive for productivity/learning, and orients students to a "just-in-time delivery" (Couture & Cheng, 2000, p.67) economic system. Aronowitz and Giroux (1985) describe a neoliberal argument which posits that students, from a very young age, should be goal directed and their orientation to "marketable" skills fostered through intense competition. The impetus or "authority" of this new ethos is not that the schools will punish, but that the cut-throat world that is life will punish the non-competitive. The two critics argue further that notions of public service, social empowerment, and active citizenship have been severely marginalized within the theoretical culture of public schooling, replaced by the "language of the instrumental" (196). This instrumentality is similar to what John Ralston Saul calls the "cult of efficiency" (1998, p.19) and what Neil Postman names "technocracy" (1992, p.42), the penetration of market criteria into every part of human life, even the developmental years of childhood.

It is useful at this point to visit the theories of a number of critical political economist who analyzes power, control and interest from what is often a deeply Marxist perspective. This, of course, places them in direct opposition to the libertarian optimism of the e-topians, the neoliberalism of the e-conomists, and the knowledge society enthusiasm of the CMEC and thus helps fill out the map of the poles in our circumnavigation of the educational planet. Herbert Schiller, the well-known American critical political economist, concludes that the information age/revolution is being driven by and is literally inseparable from the modern, globalized form of capitalism: "Contrary to the notion that capitalism has been transcended, long prevailing imperatives of a market economy remain as determining as ever in the transformations occurring in the technological and informational spheres" (in Webster, 1995, p.76). Central to Schiller's investigation of technology is the question, "for whose benefit and under whose control will it be

implemented" (p.76)? He finds that 'corporate capitalism' is the environment within which ICT innovations primarily take place and the defining feature of our present society, the information or knowledge society, simply a slightly distorted reflection of long-established architectural elements of the capitalist system. Further, Schiller finds it incredible and inconceivable that people would claim current ICT trends signify a break from the past, for how can society expect the very forces that have generated the information explosion and ICTs to be superseded by what they have created?

Similar to the critical theory of Schiller, Monty Neill (1995) feels that the push for competitiveness and high standards is based on economic determinism and many of the false premises previously identified. The current educational climate "demands that educators accept, not challenge—never mind reconstruct—the economy" (p.182). Moreover, "[c]omputerization of schools will not contribute to 'high wages' or 'good jobs'...class hierarchy will not be ameliorated by computerization, but will be intensified. Indeed, computers have been a fundamental weapon in the capitalist war against the working class over the past two decades" (pp.184-185). Although Neill articulates an interpretation of traditional schooling which parallels the e-topians, his vision of technology is very much at odds with the notion that technology will liberate and empower students:

> the very existence of thinking in schools without computers shows clearly that machines are not necessary for a thinking curriculum. The reason schools haven't encouraged thinking is not because they have lacked computers, but because the system did not want thinking workers...The controlling class no more wants problem-solvers and critical thinkers to do most jobs of the future than it did in the past, during the assembly line era. (pp.186-187)

Neill acknowledges that the drive to control and shape students to the needs of the labour market is not a new phenomenon. What is new is the means of control, the computer, and that which is to be controlled, namely, thinking. In keeping with the spirit of Lewis Mumford, Jacques Ellul, Schiller, and Paul Virilio (Haywood, 1990), Neill finds computers a tool which will be used to shape humans

to accept a malignant status quo and will result in additional social alienation: "At the crudest level, schools will try to do what they have always tried to do, shape students into workers, but the more subtle strategy is to make the mind *want* to be computerized" (p.190). Further challenging the e-topian belief that ICTs will be catalysts for intellectual and physical emancipation, he writes, "The idea that the capitalist system wants a good many critical thinkers is simply absurd—it can only spell trouble unless the thinkers are thinking for, not against, the boss. Thus the point is to produce the human as puzzle-solver, not really as critical thinker" (p.192).

Robertson and Barlow (1994), and Robertson (1998), also address the marketization of education, the highly ideological nature of curriculum, and the implementation of digital technologies. The authors, while acknowledging that schooling has the potential to be a tool of the dominant ideology through the inclusion and exclusion of subject matter, nevertheless champion public schooling as it existed during the height of the welfare state in Canada. For Robertson and Barlow, ICTs are not the answer but rather a vehicle allowing neoliberal values into education, or what they call the commercialization of public education. In other words, the corporate agenda not only wants to have schools produce good workers, they want to make a business out of schooling itself. Students are both product and consumer, taught how and why to use and buy ICTs:

> North American corporations have three fundamental goals for their preoccupation with and investment in North American schools. The first is to secure the ideological allegiance of young people to a free-market world view on issues of the environment, corporate rights and the role of government. The second is to gain market access to the hearts and minds of young consumers and to lucrative contracts in the education industry. The third is to transform schools into training centres producing a workforce suited to the needs of transnational corporations" (p.79).

The corporations which have been most vocal in calling for restructuring are the high-tech companies which stand to profit substantially from computer adoption and the computer literacy that is so in vogue. Robertson and Barlow agree with Neil Postman's conclusion that the language of

instrumentality, or efficiency, or technopoly, or whatever one chooses to call it, is working to produce "a technocrat's ideal: a person with no commitment and no point of view but with plenty of marketable skills" (p.152). Heather-Jane Robertson, in her book *No More Teachers, No More Books* (1998), looks at the issue through a slightly different lens but with the same pessimistic interpretation of technology and the modern public: "To wake up...we must recognize how our unconsciousness is induced. Technology is not only the conduit that drains power from citizens to corporations, but also the religion that keeps us in a coma" (p.120).

This last claim by Robertson typifies both the 'false consciousness' arguments and apocalyptic tone which pervades so much of the Techno-Dissident writing. Let it be said here that pointing the spotlight upon the Techno-Dissidents has not been an act of revealing *the truth* any more than reviewing the theories of the Techno-Promoters has been an attempt to argue the validity of their position(s). Rather, exploring the poles of the education/technology discourse has been an effort to explode the simplistic assumptions and paradoxical rhetoric of the CMEC. Balanced if not progressive in its "vision" for the future of public education, the Council has in fact been operating in a way that privileges the economic needs and social status quo over the development of individuality and critical thought. What becomes readily apparent, while navigating through the educational discourse, is that the debate is plagued by the same Achilles heal that seems to afflict so much of the news media: sensationalism sells. Whether it be the claim of "no more teachers, no more books" or "the end of education" or "the computer will blow up the school" or the school intentionally confuses process and substance or the teacher can never be anything but a tool of the dominant ideology, the discourse seems all too often to suffer from hyperbole and ideological rigidity. Even when a theorist or organization attempts to reconcile both sides of the debate, there is frequently a simplification and/or, in the case of the CMEC, only a rhetorical commitment to

balancing educational philosophies in the name of learners' needs. The question is, in the face of rapidly evolving ICTs, the fervent implementation of such technologies into public education, and a paradoxical position by the CMEC and other neoliberal groups which privileges the neoliberal agenda and centralized control, can anything be done? Do teachers, parents, and students—*all* citizens in fact—have the ability to exert influence on the direction of change, and if they do, what should be the rate and nature of those changes?

Agency, Democracy and Public Education

It seems that those employing critical theory and those looking for the 'effects' of technology, for all of their worthwhile observations and critiques of the capitalist system, suffer from undercurrents of determinism not altogether different than the determinism of many neoliberals and Techno-Promoters. Incorporating critical analysis and observations concerning the societal shaping power of technology into a framework which offers a role for human agency and the hope of a better future has been the work of structration theorist Anthony Giddens. Writing over the last thirty or so years, and in keeping with the theme of balance which has permeated this paper, Giddens attempted to build a workable theory which avoided any devotion to the determinism inherent in much Marxist structural analysis while also avoiding the idealism and radical individualism which burdened many of the agency-oriented theories. Giddens' theory of structuration has undergone refinement and increased sophistication through the years, all the while generating a great deal of debate and criticism from both structuralist and humanist camps.

Giddens' search for a middle ground has also drawn large numbers of supporters who also desire alternative theoretical foundations. For many of them:

> theoretical purity can camouflage either *determinism* or *idealism*. Through the Marxist lens,

> the camera can be construed as only seeing social, political and economic constraints, and ignoring the purposefulness and spirit of individuals; through the humanistic lens the camera can be seen to catch the ideals and cultures of individuals and groups, but not the political and economic boundaries within which individual and group behaviour is put into practice. Somehow, if only the insights concerning both *structures* and *human agency* could be interlinked, then social science would have a more realistic grounding for its thinking and practising. (Cloke, Philo, and Sadler, 1991, p.94)

Giddens looks to human action as rational, ordered and initiated by human agents who are knowledgeable and capable rather than cultural dupes. Change, within structuration theory, is then a 'skilled accomplishment', though the idea is more complex than this. Accomplishments, or agency, are not in opposition to structure, rather structure serves as an enabling entity. In other words, one must:

> recognise the *duality of structure*: that is, the manner in which structures enable behaviour, but behaviour can potentially influence and reconstitute structure; and...the *duality of structure and agency*: that is, to transcend the dualism of deterministic views of structure and voluntaristic views of agency. (Cloke et al, 1991, p.98)

In this way individual action, history and society are all interdependent, no one more important than another, with human agents working within and upon the institutions of government, civil society and economy. Of course, the balance between agency and structure are different in a dictatorship than they are in a liberal democracy, human agent's motivation is played upon by a variety of benign and malevolent forces, and the rules that govern human interaction (societal norms) vary from culture to culture, but the point holds that human beings are constructed and construct, make conscious decisions and are affected by unconscious impulses, and in the end can affect structural and social change but almost always at a rate which can give the illusion that nothing has changed, especially when compared to the rapid technological changes going on around them.

Turning our eyes back to education, the claims of those who would have us believe that public schooling is nothing more that pure indoctrination, a form of mind control which produces

working and consuming drones and which offers no chance for reform nor critical thought falls flat, appearing as a naive and unsophisticated reading. This is not to argue that all is right, but only that structuralism and economic and technological determinism are insufficient in helping explain the development, current situation and future of education. Indeed, Livingstone (1998) finds education to be the "indeterminate result of confrontations and negotiations between historically specific groups of class-based agents" (p.45). For Livingstone, education can hardly be construed as an inevitable progression expressing the structural imperatives of capitalist production, nor can it be portrayed as merely the contingent expression of class conflicts. Somewhat more pessimistic than Giddens, Livingstone falls back into his Marxist roots and describes the experience of individuals moving through the education system as "contested subordination" (p.49) where we make our own histories but in contested contexts not of our own choosing.

In *Education Under Siege* (1985), a similar position to Livingstone is articulated by Aronowitz and Giroux who find that, yes, schools play an important part in generating and "reproducing" dominant myths about individualism, democracy and rights. They do more than mediate the "logic of domination," schools:

> play an active role in legitimating the view that politics and power are primarily defined around the issues of individual rights and through the dynamics of the electoral process...The importance of this ideology as a contradictory part of the hegemonic curriculum cannot be overstated...it functions to separate the issues of politics and democracy from the economic sphere and to displace the notion of conflict from its class-specific social context to the terrain of individual rights and struggle.(p.94)

Where "reproduction" theorists like Lloyd and Thomas, Papert, and Illich would end with this assessment, with the education system ideologically fused and inherently disciplinary and repressive, Aronowitz and Giroux open the door to "spaces of resistance," writing that "there is a certain counter-logic in democratic liberal ideology that provides the basis for resistance and

conflict. That is, liberal democratic ideology contains concerns for human rights that are often at odds with capitalist rationality, its ethos of commodity fetish, and its drive for profits" (94). They find that theories of the state like the one advanced by Lloyd and Thomas tend to fail due to how little they have to say on human agency and their devotion to macro and structural issues.

Further, Aronowitz and Giroux (1985) believe that:

> Reproduction theorists have overemphasized the idea of domination in their analysis and have failed to provide any major insights into how teachers, students, and other human agents come together within specific historical and social contexts in order to both make and reproduce the conditions of their existence...schools are often viewed as factories or prisons, teachers and students alike act merely as pawns and role bearers constrained by the logic and social practices of the capitalist system" (pp.70, 71)

The reproduction models of state institutions, and education in particular, falls into a "reductionist instrumentalism" (p.79), a "radical pessimism" (p.79) that offers little hope for socially progressive praxis nor reason for activists to develop alternative educational paradigms. For Aronowitz and Giroux, the reductionism inherent in such arguments silences any, as they call it, "language of possibility" (p.79). For them, schools are contested terrains where structural and ideological contradictions abound, where there in fact exists "collectively informed student resistance" (p.71), and where teachers and schools exist "somewhat independently" (p.72) of the market economy and state interest. Clearly this is in direct contradiction to Lloyd and Thomas (1998), who consider the teacher the "primary agent" through which "the internalization of normative values in the child is facilitated" (p.117). Sounding much like structuration theorists, Aronowitz and Giroux offer more than a ray of hope, they describe a public education system where the potential for positive change is not only possible but simply waiting for compassionate, reflective groups and individuals to take the initiative.

The tenets of structuration theory, and the optimism of similar viewpoints expressed above,

can also be transferred to technology via Paul Levinson, Manuel Castells, and, to some extent, Neil Postman. From Levinson we can take the realization that technology ends up being used in a myriad ways never intended by the inventor and that technologies are never finished but always in a process of remediation, or improvement and suitability to human and societal needs. Like Neil Gershenfeld (1999), an MIT researcher who believes that computers are currently at a very awkward and intrusive stage in their development and we should expect much more from digital technologies, Levinson argues that ICTs are in their "caterpillar" stage, that they have yet to emerge into the wondrous and worthwhile tool they could become. Founding his optimism is Levinson's belief in human choice and the "capacity for rational, deliberate decision and planning regarding media" (p.4), though this free will also entails both responsibility and the acceptance of unintended consequences. If Levinson is perhaps a tad optimistic, and does not pay enough attention to power and politico-economic factors, Manuel Castells brings free will back into the reality described by Giddens:

> we take up our courage, invent, calculate, think, fight, and work to turn the extraordinary opportunity of information technology into the promise of a more humane society, based not on social exclusion but on shared creativity. Yet, to do so, dreams have not just to be blueprinted but fought over. Because the information age has not changed the reality that the power of technology still depends on the technology of power. (p.9)

As mentioned earlier in the discussion around technological determinism, Castells perceives a world where change is "multidimensional" and can be modified by social movements, individual efforts, and policy direction.

CONCLUSION: Towards 'Best Practices'

That citizens can fight and think and invent gives little instruction on what to fight for and think about and invent when it comes to education, except perhaps that we must teach to young people that the potential for such struggle exists. I would like then to return to the concept of 'best practices', of pulling from different philosophies those ideas which are most useful and most compatible: the optimism of the e-topians, the cognizance of e-conomists that work and skills are an important part of people's lives and that ICTs are central to future work, and the awareness of Techno-Dissidents that technology and curriculum are powerful ideological tools which have often and could continue to foster inequalities and the privileging of certain groups. Throughout this paper I have not been arguing for the status quo, nor a return to anything which has previously existed. There is much that was and is good about the current education system, but change is constant and to take a conservative position is to lack imagination. The public education system in Canada must become more fluid, adapting to a diversity of learning needs. Truly, learner-centred education is good for some highly motivated students but not all students. Some learners thrive through projects and discovery, others gather information more beneficially through listening to lectures, some students need more physical activity than others, and still others respond well to traditional discipline. Many educational reforms and theorists are guilty of ignoring diverse learning styles and social needs, offering blanket solutions which create as many problems as are remedied. I think this would have to be the central hope for ICTs in education, that they free educators from teaching styles necessitated by high-numbers of students and sparse resources and, instead, deliver public education to a place where students possess and exercise greater intellectual freedom, though still within a guiding structure which maintains certain key pedagogical tenets.

That change is constant does not mean that there do not exist certain truisms and

fundamental goals. For instance, no matter what shape or form the classroom comes to take it will always be a place, as Larry Cuban (1986) has said, "steeped in emotions" (p.89), a place where symbolic and physical interaction does and should exist between an empathetic, knowledgeable, and ethical professional—call them what you want—and young learners whose fervent minds and creative drives must be directed and nurtured for their benefit and the benefit of society as a whole. A postmodern vision of all children growing up with little to no instruction or received wisdom is both untenable and a recipe for the emergence of a culture of egomaniacs. To say that what makes a child-learner happy and what they need are two different things is not likely to be popular among many radicals, but to capitulate to the whims of a mind experiencing the combination of almost daily novelty, hormones, and social learning is to abandon the commitment to critical thought, the development of a social conscience, and the imparting of wisdom. I do not think it an overstatement when I say that the future of the human race depends on young students learning about the past, the importance of environmental degradation, or about negative social repercussions of technological advancement such as nuclear and biological weapons. Without a gatekeeper, without a system which pays and supports education professionals, there is little guarantee that a learner would voluntarily attend to or "discover" such complex issues and, even if they did, be able to contextualize them. John Dewey (1944) puts ever so succinctly the importance of education in a technologically advanced/ing society:

> With the growth of civilization, the gap between the original capacities of the immature and the standards and customs of the elders increases. Mere physical growing up, mere mastery of the bare necessities of subsistence will not suffice to reproduce the life of the group. Deliberate effort and the taking of thoughtful pains are required. Beings who are born not only unaware of, but quite indifferent to, the aims and habits of the social group have to be rendered cognizant of them and actively interested. Education, and education alone, spans the gap. (p.3)

So if school is important, if having human guidance is important, and if choice is available, how do

we go about implementing technology so that learners emerge empowered, ready to question the status quo, but also imbued with the skills necessary for them to have vocational confidence and earn a living?

One of the 'aims and habits' that Dewey talks of must always be democracy, and democracy must be one of the primary concerns when implementing ICTs into public education. Often it is argued that democracy depends on local control, versus the centralization and standardized testing which is currently in vogue and carried out by the CMEC. However, democracy is also dependent upon a shared knowledge base, a symbolic world that is both historical and teleological and allows citizens to engage in rational, hopefully complex debate. For this to happen, education bureaucrats and teachers must ensure lofty standards, core knowledge, and high literacy levels, all of which logically demand some form of testing or curriculum standards. Testing and centralization can of course pass the point of diminishing returns—a point the CMEC would appear to be approaching—but there is a place for evaluation and dialogue around standards if there is to be an orientation toward democracy. Local control, even curricular decisions by individual teachers, is not incompatible with regional or even national guidelines. Only when educators feel disempowered and devalued by the removal of their right to choice, and a right to grant their students choices, does there exist the potential for a decline in the quality of schooling. For the purpose of democracy, and similar to the goals of learner-centred reformers, ICTs must be implemented as part of a larger realignment towards dialogue, lateral thinking, critical analysis, and empowerment. Students, while working within a broad curricular structure, should feel as if they have options to choose from, decisions to make, opinions to express. The democratic system depends on active minds and a sense that individual opinions matter but also on a collective knowledge base.

As Aronowitz and Giroux (1985) make clear, functional illiteracy is a major issue for both

critical theorists worried about democracy and neoliberals/neoconservatives concerned with economic competitiveness. However, the study of and participation in democracy necessitates not only functional literacy but historical and critical/conceptual literacy as well. From learner-centred approaches to education, like those articulated by the CMEC and others, there are valuable lessons to be learned about students' need and desire for greater empowerment and choice. ICTs can go a great distance in helping the public education system provide individualized, high-quality content which brings history to life and introduces young students to complex issues. This has occurred without computers, obviously, but the multimedia experience changes how and where such pedagogical events can take place, hopefully aiding in orienting the public education system to the media-use and sensibilities of current and future generations without sacrificing high standards and excellence. As much as many Techno-Dissidents chastise the studies that have examined technology in the classroom, and some have admittedly been biased by corporate sponsorship and the desire to find positive results, a lack of substantial, well-designed research does not mean that no benefits exist or are possible. In fact, many (Wellburn, 1996; Hill and Smith, 1998; Brunner and Tally, 1999; Cummins and Sayers, 1995) have produced studies—some specific, others of the meta-analytic variety—which found very promising signs emerging from technological adoption in schools. Add to these favourable results the process of remediation and a commitment to moderate and well-planned use and it would seem negligent to withhold ICTs from students, negligent and just as naive as those advocating immediate and total implementation with no safeguards. Digital technology may very well be driven by and often controlled by corporate interests but the use of such technologies is ultimately controlled by teachers, school administrators, students, and parents who have the capacity to exert a great amount of pressure on school boards and education ministries. One of the main reasons for the explosion of digital ICTs has in fact been their

malleability, their capacity for a myriad number of uses, and for the increasing ease with which they can be remediated. Implementation of computers and other ICTs will most certainly depend on a financial commitment by governments, not just for the technology, but to guarantee that teachers have quality training and equipment, that arts and sports and music are not sacrificed, and to ensure that educators and learners feel empowered. This is not to advocate wild spending nor imply that educational administrators will be free from budgetary constraints, only that fiscal responsibility must not lead to a mindset which values market criterion such as efficiency and cost-effectiveness at the expense of broad, liberal, democratic goals. Education at all levels must remain one of Canada's top funding priorities.

To ensure that ICTs are implemented in a way which is neither deterministic, excessively oriented to vocational ends, nor excludes certain demographic groups, organizations like the CMEC are extremely important. However, in agreeing with the CMEC that a successful education for Canadians demands at least some movement towards a "national approach," I must reiterate that it also demands that those who lead such an approach had better deal in honesty, living up to their rhetoric through balanced policy decisions. This is, of course, easier demanded than accomplished, as pressure is exerted from multiple ideological directions, but I believe I have shown that the CMEC has failed to move even a small distance towards the learner-centred education it so strongly advocates. In the end, the implementation and debate around ICTs is subordinate to the larger questions of pedagogical philosophy. The wringing of hands over specific questions of implementation is often an unnecessary waste of intellectual energy. What really matters is the over-arching philosophy which structures the system into which technology is injected.

Education is special, it is different than many other parts of our culture where there is less control over implementation. In public education we find a world where very deliberate decisions

can and are made over the extent to which a curriculum directive or testing policy or digital technology will be employed. Teachers still possess an abundance of power, which may be the reason they are so often lamented if not vilified. As a group of intellectuals invested with the responsibility of helping develop future generations, the success of ICTs in helping learners depends very much on organizations like the CMEC finding a more even, inclusive approach. As Ken Osborne (1999) made clear early in this paper, people find in education whatever they are looking for. To set out what we might look for in the public education system of the future, let us start with the idea that public education is not a business, students are not customers but participants, and there is no profit although there is growth. The CMEC must make certain that it not only acknowledges the diversity of ideological positions that exist, the Council must pay them much heed as they lead public education into the next century. In the CMEC we find wonderful potential, as wonderful as we might find in a young student. What needs to happen from here is a process of maturation, where corporations, teachers, parents, and even students meet at the table, are given a platform to voice their concerns, and can begin to shape the CMEC into a force which benefits all stakeholders, all learners, and all learning styles.

Bibliography

Armstrong, A. and C. Casement (1998). *The Child and the Machine.* Toronto: Key Porter Books Limited.

Aronowitz, S. & H.A. Giroux (1985). *Education Under Siege.* South Hadley, Massachusetts: Bergin & Garvey Publishers, Inc.

Barlow, M & H.J. Robertson (1994). *Class Warfare.* Toronto, ON: Key Porter Books.

Boschman, E. (1995). "Preface." In *The Electronic Classroom.* Ed. Erwin Boschman. Medford, NJ: Learned Information, Inc.

Burke, M. & J. Shields (1999) *The Job-Poor Recovery : social cohesion and the Canadian labour market.* Toronto : Department of Politics, Ryerson Polytechnic University.

Castells, M. (1996). "The Informational City is a Dual City: Can it be Reversed?" in *High technology and Low-Income Communities.* Eds. Schon. D, B. Sanyal, and W. Mitchell. Cambridge, MA: MIT Press.

Cloke, P., C. Philo & D. Sadler (1991). *Approaching Human Geography.* New York: The Guilford Press.

Council of Ministers of Education, Canada (1993). *Victoria Declaration.* <www.cmec.ca/releases/vicdecen.htm>

Council of Ministers of Education, Canada (1996). *Enhancing the Role of Teachers in a Changing World.* <www.cmec.ca/international/teacheng.htm>

Council of Ministers of Education, Canada (1997a). *Towards Well-Balanced Technology-Enhanced Learning Environments: Preparing the Ground for Choices Ahead.* <www.cmec.ca/reports/infoteche.stm>

Council of Ministers of Education, Canada (1997b). *Developments in Information Technologies in Education.* <www.cmec.ca/reports/edtech-en.stm>

Council of Ministers of Education, Canada (2001). *School Achievement Indicators Program (SAIP).* <www.cmec.ca/saip/math2001/public/factsheet.en.asp>

Council of Ministers of Education, Canada (1996). *The Common Framework of Science Learning Outcomes: K to 12.* <www.cmec.ca/science/framework/Pages/english/1.htm>

Council of Ministers of Education, Canada (2002). *CMEC's Initiatives in the Elementary-Secondary Sector.* <www.cmec.ca/else/indexe.stm>

Connor, S. (1997). *Postmodernist Culture.* 2nd ed. Cambridge, MA: Basil Blackwell

Couture, J.C. and Leying Cheng (2000). "Teachers' Work in the Global Culture of Performance." *Alberta Journal of Educational Research*, v.46(1), pp. 65-74.

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

Cummins, J & D. Sayers (1995). *Brave New Schools.* New York : St. Martin's Press.

Dei, G.J. & L.L. Karumanchery (1999). "School Reforms in Ontario: the Marketization of Education and the Resulting Silence on Equity." *Alberta Journal of Educational Research*, 45(2), pp. 111-131.

Dewey, J. (1938). *Experience and Education.* New York, NY: Collier Books.

Dewey, J. (1944). *Democracy and Education.* New York: The Free Press.

Dierker, R.A. (1995). "The Future of Electronic Education." In *The Electronic Classroom.* Ed. Erwin Boschman. Medford, NJ: Learned Information, Inc.

Drucker, P. (1994). "The Age of Social Transformation." *The Atlantic Monthly*, November, pp.53-80.

Dunn, R.G. (1998). *Identity Crisis: A Social Critique of Postmodernity.* Minneapolis: University of Minnesota Press.

Eagleton, T. (1996). *The Illusions of Postmodernism.* Malden, MA: Blackwell Publishers Inc.

Innis, Harold A. (1951). *The bias of communication.* Toronto: University of Toronto Press.

Featherstone, M. (1991). "Modern and Postmodern: Definitions and Interpretations," in *Consumer Culture and Postmodernism.* London: Sage.

Franklin, U.M. (1999). *The Real World of Technology.* Toronto: House of Anansi Press Limited.

Gardiner, W.L. (1997). "Can Computers turn Teaching Inside-Out, Transform Education, and Redefine Literacy?" In *Media Literacy in the Information Age*, ed. Robert Kubey. New Brunswick, NJ: Transaction Publishers.

Gershenfeld, N. (1999). *When Things Start to Think.* New York, NY: Henry Holt and Company.

Gidney, R.D. (1999). *From Hope to Harris.* Toronto: University of Toronto Press.

Giroux, H.A. & P. McLaren (1989). "Introduction: Schooling, Cultural Politics, and the Struggle for Democracy" in H.A.Giroux & P. McLaren (eds.) *CRITICAL PEDAGOGY, THE STATE, and CULTURAL STRUGGLE.* New York: State University of New York Press.

Godfrey, D. (1980). "No More Teacher's Dirty Looks." In *Gutenberg Two*, eds. D. Godfrey & D. Parkhill. Toronto: Press Porcepic.

Gradwell, J.B. (1999). "The Immensity of Technology...and the Role of the Individual." *International Journal of Technology and Design Education*, V.9, pp.241-267.

Graham, D.R. (1997). "The Classroom Computer Revolution that Hasn't Happened–Yet." *Education Canada*, Spring, pp.10-14.

Haywood, P. (1990). "Technology and the (Trans)formation of Culture." In *Culture, Technology & Creativity.* London: John Libbey.

Healy, J.M. (1998). *Failure to Connect: How Computers Affect Our Children's Minds—for Better and Worse.* New York: Simon & Schuster.

Hillen, D. (1999). "In Memoriam: The Hall-Dennis Report." *Education Forum*, 25 (4), p. 16-18.

Kellner, D. (2001). "New Technologies/New Literacies." *International Journal of Technology and Design Education*, V.11, pp.67-81.

Larrain, J. "Identity, the Other and Postmodernism," in *Transformation.*

Levinson, P. (1997). *the soft edge – a natural history and future of the information revolution.* New York: Routledge.

Livingstone, D.W. (1998). *The Education Jobs Gap.* Boulder, Colorado: Westview Press.

Lloyd, D. & P. Thomas (1998). *Culture and the State.* New York: Routledge.

Mattys, S. (2000). "Is History History?" *Briarpatch*, v.29(6), pp.11-12.

Massachuset Institute of Technology (2000). "MIT Media Laboratory Research group Projects." <gonzo.media.mit.edu/public/web/>

McLuhan, Marshall (1964). *Understanding media : the extensions of man.* New York : McGraw-Hill, 1964.

Negroponte, N. (1998). "One-Room Rural Schools." *Wired*, v.6(9).

Nikiforuk, Andrew (2000). "Digital Dunderheads." *Canadian Business*, v. 73(4), p.12.

Osborne, K. (1999). *Education: A Guide to the Canadian School Debate – Or Who Wants What and Why?* Toronto: Penguin Books Ltd.

Papert, S. (1980). *Mindstorms*. New York: BasicBooks.

Papert, S. (1993). *The Children's Machine*. New York: BasicBooks.

Percy, Walker (1975). *The Message in the Bottle*. New York: Farrar, Straus and Giroux.

Postman, N. (1993). *Technopoly*. Toronto: Random House.

Postman, N. (1995). *The End of Education*. New York: Alfred A. Knopf, Inc.

Reinecke, I. (1982). *Electronic Illusions*. New York: Penguin.

Robertson, H. (1998). *No More Teachers, No More Books*. Toronto: McClelland & Stewart Inc.

Rogers, E.M. (1962). *Diffusion of Innovations*. New York: The Free Press.

Roszak, T. (1994). *The Cult of Information*. Los Angeles: University of California Press.

Saul, J. R. (1998). "John Ralston Saul: Public Education, Democracy and an Unconscious Civilization." *Education Today*, v. 10(2), pp.17,20-1.

SchoolNet, Canada's (2000). *Mandate*. <www.schoolnet.ca>

Sears, A. (2000). "Education for a Lean World" in M. Burke, C. Mooers & J. Shields (eds.) *Restructuring and Resistance: Canadian Public Policy in an Age of Global Capitalism*. Halifax: Fernwood Publishing.

Shenk, D. (1999). *the end of patience*. Bloomington, IN: Indiana University Press.

Slopek, E. (2002). [unpublished lecture handouts]. Toronto, ON: Ryerson University.

Taylor, A. (1997). "Education for Industrial and 'Postindustrial' Purposes." *Educational Policy*, V.11, Issue 1, p.3, 38.

Upitis, Rena (1999). "Impact of the Communications Revolution on Education: Possibilities for the Coming Millennium through an Artist's Eye." In *The Communications Revolution at Work*. Ed. Robert Boyce. Montreal & Kingston: McGill-Queen's University Press.

Vattimo, G. (1992). *The Transparent Society*. Cambridge: Polity Press.

Webster, F. (1995). *Theories of the Information Society*. New York: Routledge.

Wellburn, E. (1996). *The Status of Technology in the Education System: A Literature Review.* <www.cln.org/lists/nuggets/EdTech_report.html>

Wilden, Anthony (1980). *System and Structure.* London: Tavistock Publications.

Winner, L. (1977). *Autonomous Technology.* Cambridge: The MIT Press.

Woodward, Wayne (1996). "Triadic Communication As Transactional Participation." *Critical Studies in Mass Communication.* V. 13, 155-174.