AT THE HEAD OF THE CLASS: LEARNING FROM EDUCATION RESEARCH IN AN INFORMATION AGE

by

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ABSTRACT

This thesis examines ongoing debates around educational technology within Canadian schools, and advances methodological recommendations for additional education research in the social sciences. By focusing on teachers, students, and Canadian society at large, education researchers can question ideologies of the Information Age and help develop curricula that are both democratic and sustainable.

The relationship between education and the economic sector must be investigated and critiqued; deterministic ideologies, be they technological or economic, threaten the sustainability of public education in Canada. Education research investigating educational technologies should also consider cultural discourses surrounding computer technologies, particularly those associated with youth culture.

Finally, this thesis proposes various methodological frameworks for future research. The social sciences must play the pivotal role in strengthening public education, and the field of Communication is ideally positioned to explore the impacts of the Information Age on Canadian schools.

Keywords: Education; Computers; Social Sciences

DEDICATION

This thesis is dedicated to all of the teachers – good and bad – that I've had the pleasure of working with. You've instilled in me a passion to learn, a need to question, and a genuine appreciation for the profession. It isn't easy, but someone has to do it.

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TABLE OF CONTENTS

CHAPTER 1:
THE EDUCATIONAL TECHNOLOGY DEBATE

> *Teeth gnash every day over the effects of electronic communications and weakening family structures. Yet all we do is fiddle with the content of courses and agonize over teaching methods [...] We could do worse than to reduce classes from the typical twenty to thirty students down to ten. This would mean hiring more teachers and our public budgets tell us there is no available money. A more important point is that there'll be even less money in a society of functionally illiterate citizens. (Saul 1994: 116-117)*

In the field of Canadian education research, there are few topics more urgent, complex, and contentious as the use of educational technologies in public school classrooms. As federal and provincial governments continue to spend vast sums of money on hardware, software and training, academic researchers continue to debate the pedagogical merits of computer technology. After years of debate, however, virtually every Canadian school is now wired and online. The computers are in the classrooms and in the home, in the parents' workplaces and in the teachers' colleges. Arguably the significance of the educational technology debate is not to be found solely in its outcome (the actual placement of computers in classrooms); rather, the greater importance might be found in the form and content of the debate itself. As Todd Oppenheimer argues, understanding the contested nature of modern education technology goes well beyond simple technical detail; because this technology "has arrived so quickly and is so powerful, it can brightly illuminate realities that surround it, like a lantern suddenly dropped into an old, dusty cave" (2003: xvi). Consequently, many of the

concerns raised in the educational technology debate have far more to do with public education itself than with the specific technical tools being considered at any given moment.

The arguments presented for or against computers in classrooms should draw public attention to the size and shape of the 'dusty cave' we call Canadian public education. The structural integrity of this cave has been suspect for some time now, drawing pointed attacks from critics, and endless prophecies of imminent collapse. (That these particular attacks are also entering their third decade is hardly a coincidence, as I will explore in subsequent chapters.) Each year, opinion polls and think-tank reports warn of impending doom, further building the general belief that public education is in perpetual crisis. As Murray Dobbin writes:

> The myth making is now well established: our schools graduate students who are illiterate; students aren't being prepared for work in the new corporate world; their math and science skills are inferior to those of Asian students; there is a 30 percent drop-out rate; teachers and their unions resist change and make it impossible to fire bad teachers; there is no 'choice' in education, and public schools and their students remain 'prisoners of mediocrity and educational gridlock.' (1998: 239)

The sky is falling, the cave is collapsing, the end is near. No matter which figure of speech is employed, the message is the same: public schools are failing our children, draining our tax dollars, and threatening our collective future in a global economy.

The truth, of course, is far more nuanced and hopeful, and University researchers are particularly well positioned to examine the rhetoric surrounding public education. This thesis will argue that, despite significant efforts by a range

of theorists and commentators, there is still much that can be done to improve the health and sustainability of public education in Canada. Furthermore, the field of Communication has the opportunity to take a leading role in this effort, owing to its methodological richness and inherent multi-disciplinarity. It is entirely reasonable – and indeed necessary – that the research underpinning this thesis emerges from within the discipline of Communication, as it is from within the expansive boundaries of the field that new models for education research can be found. Despite the emphasis on education and technology, this thesis is ultimately about Communication and the role of academic research in Canadian society.

1.1 Public Education and Canadian Society: Social Science Research to the Rescue?

Predicting the end of public education is hardly a new phenomenon, but it is never a concern to be taken lightly. Whether computers are our only hope for salvation, or whether they further exacerbate our present condition, the stakes of the educational technology debate are much higher than the warring factions often admit. Monitoring the well being of Canadian public education through the lens of educational technology demands that we tread very carefully. As Neil Postman observes:

> Not all ignorances are of equal importance, [and there is] nothing worse than ignorance on the subject of education. This is so because the subject of education claims dominion over the widest possible territory. It purports to tell us not only what intelligence is but how it may be nurtured; not only what is worthwhile knowledge but how it may be gained; not only what is the good life but how one may prepare for it. (1988: 85)

Because our collective values and desires are at stake when we discuss public education, the researchers, academics and policy-makers working in the field of education exert influence that can go well beyond Canadian classrooms. Education's dusty cave may indeed need an overhaul, but we cannot significantly alter the cave's condition without affecting the ground above it too. In public education's case, we risk altering the very foundations of Canadian society. As John Ralston Saul writes:

> The existence of high-quality national public education school systems is the key to a democracy where legitimacy lies with the citizen. At first hearing, this may sound like a motherhood statement. But the reality is that [...] we are slipping away from that simple principle of high-quality public education. And, in doing so, we are further undermining democracy. (1995: 65)

As the educational technology debate has been so widespread and so visible in the past few decades, the implications of this particular issue urgently demand our attention. Understanding how Canadians, and particularly members of the academic community, have navigated the educational technology debate can illuminate far more than the contours of public education itself; it gives us an important insight into the health and wellbeing of our most longstanding cultural values and practices.

In order to appreciate the complexity of the debate, it is important to note that while the body of research available on educational technology is enormous and varied, the changing realities of computer use in Canadian classrooms are not always reflected in education research. In many instances, highly problematic generalizations obscure the diversity inherent in public education: a range of distinctive tools are grouped together into the single category of 'educational

technologies'; the experiences and personalities of Canadian teachers are ignored in an effort to universalize the teaching process, and the uniqueness of students is similarly homogenized to facilitate discussions of the learning process; finally, the essential differences between training and educating are pushed aside to make room for the needs and desires of numerous external parties. Education research also tends to have a rather short institutional memory, emphasizing new concerns and new opportunities, at the expense of enduring educational considerations. With the introduction of so many computers into classrooms over the past decade, for example, many researchers now consider the so-called 'digital divide' to be a thing of the past. As Terry Wotherspoon notes, however, significant inequalities in technology access persist; even though "Internet use has expanded significantly across all income groups in Canada, [...] the divide between the top and bottom income groups has persisted or even widened since the mid-1990s" (2004: 265). A similar lack of long-term focus can be seen in many discussions of technological training in public schools, which focus on economic and social imperatives, rather than actual temporal realities; "Essentially," writes Saul, "a new, high-level course in typing is being presented as if it were fundamental education" (1995: 138). Technical training certainly has its uses within various employment settings, but introducing Canadian students to specific technologies while in school will only result in graduates with obsolete skills.

Many researchers engaged in the educational technology debate do, of course, take these considerations very seriously. Keeping pace with

technological change, however, has proven to be far easier than keeping pace with social change. As Patricia O'Riley observes:

> Although the revisionings have been done through the new high tech frames, sadly the lenses remain unaffected, myopic. Gender, culture, socioeconomics, and the environment are beyond the sightlines, mere optical illusions, rhetorical delusions. (2003: 5)

The ecology of knowledge within Canadian universities is therefore of central importance to this analysis of the educational technology debate and its impacts. Specifically, the disciplinary boundaries of the social sciences are implicated in the ongoing failure to transform more research into concrete educational policy and theory. The public value of education research, particularly research dealing with computer technologies, needs to be thoroughly addressed if the social sciences are to continue playing a key role in Canadian society. John Willinsky writes that, "As a general rule, social scientists promise, on grant applications and elsewhere, that their work is devoted to improving the quality of people's lives. The granting agencies, in turn, like to frame their research support as an investment in public good" (2000b: 275-276). As few research areas are as inseparable from the public good as education, examining the content of education research must include an examination of the political economy of the research itself. Accordingly, this thesis will examine the history of the educational technology debate as a litmus test of the social sciences themselves, illustrating the strengths and weaknesses of the university's current divisions of knowledge. Of course, all universities and colleges organize knowledge in one way or another; the problem, as Postman argues, is that:

> Sometimes a university can suffer from hardening of the categories. This happens when certified scholars resolve, against all reason, to defend their customary view of knowledge from encroachments by more novel perspectives [...] [Scholarship] can become – in the hands of some people, at least – a social institution with primarily defensive, conserving functions, ordering and stabilizing rather than discovering and renewing. (1988: 4).

As an indicator of how the social sciences create and disseminate public knowledge, educational technology research can provide both a critique of ineffective practices and an indication for future research directions. However, as I will argue in this thesis, the difficulties facing social science research are symptomatic of much broader social concerns, stemming from changing attitudes toward both education and technology.

1.2 Determinisms, Old and New

Over the past few decades, academic battles over educational technologies have resulted in specific changes, but the cumulative impact of these battles is much more difficult to read. Many education researchers have grappled with broad social issues when dealing with classroom technologies, but the focus has tended to remain on the technical aspects of educational technology. Identifying and critiquing technologically deterministic research is practically a rite of passage in some academic circles. While it is undoubtedly important to recognize and avoid this form of deterministic thinking in education research, too much attention to one threat can obscure additional concerns. Consequently, as education researchers spent decades warning of the dangers inherent in letting technology sit in 'the driver's seat,' they have failed to notice key details of their own surroundings. This is because the same period of time

characterized by rapid technological advancement also saw the rise of a new form of deterministic thinking: one that has shaped Western society in profound, if generally unseen, ways. Economic determinism, writes Saul:

> Is presented as if neither the presenter (a coalition of interest groups) nor the receiver (the public) have any active role to play because the global economy is going to arrive whether they like it or not. In this way a complete ideological policy can be advanced without any discussion of its implications or any admission that it is an ideology. (1994: 144)

While many education researchers have tended to focus on technological determinism when debating the worth of educational technologies, the effects of economic determinism are arguably more far-reaching and universal.

The impacts of specific educational technologies may assist or hamper the educational process, but researchers must consider that the entire process itself has now been enlisted in the service of specific, directed economic goals. The effect, as Douglas Noble argues, is that "While new technologies, most notably computers, are increasingly viewed as tools in the service of education, it is rarely noted that education itself is now conceived, ideally, as a tool, a sophisticated supply system of human cognitive resources, in the service of a computerized, technology-driven economy" (1991: 1). The now defunct TeleLearning Research Network – and its Networks of Centres of Excellence – effectively demonstrates the extent to which economic imperatives can shape educational efforts. As Donald Gutstein argues, these networks were designed to conduct research on behalf of industry, thereby "creating another institutionalized subsidy for business" (1999: 171). Given the scale and scope of these 'collaborative' efforts, it is therefore imperative that education studies – and the

social sciences more broadly – recognize the inherently ideological nature of the debate in which they are participating. Education, now implicated at the heart of a deterministic model of economic development, can no longer be treated as a value-neutral research site. The educational technology debate is positioned to play a crucial role in understanding economic determinism's influence over Canadian society, because it can investigate not only the ideological nature and political economy of specific computer technologies (which have, in various shapes and sizes, infiltrated virtually all major areas of business and culture in Western societies), but also the changing purpose and placement of public education in Canada.

The first step is to understand how our present economic model has come about, so that we can begin to construct alternative frameworks for public education – and Canadian society more broadly – to proceed, unencumbered by its current ideological baggage. In its basic form, this framework relies upon a simple, yet profound rejection of economic determinism's central beliefs. Whereas economic determinism holds that education and technology have no choice but to cooperate in the face of a global economic network guiding all human activity, education researchers wishing to disrupt determinism's hegemony should insist, at every possible opportunity, that education, technology, and even the 'global economy' are still human constructions, ultimately serving human needs and values. Paulo Freire expressed and lived such a belief for most of his life, insisting that:

> As great as the conditioning power of the economy may be over our individual and social behavior, I cannot accept being completely passive

> before it. To the extent that we accept that the economy, or technology, or science, it doesn't matter what, exerts inescapable power over us, there is nothing left for us to do other than renounce our ability to think, to conjecture, to compare, to choose, to decide, to envision, to dream. (2004: 33)

Economic determinism, perhaps even more than technological determinism, threatens the democratic potential of public education, because it attempts to limit humankind's most creative abilities; what room is there for hope, or for utopian desires, when we are all passive servants of a global economy, seemingly without operators or masters?

1.3 Thesis Structure: Three Areas for Investigation

This thesis will explore three central areas of concern in the educational technology debate – areas that I will argue have been overlooked, underemphasized, or generally just misunderstood. Together, these three chapters will provide a survey of an ongoing debate, detailing the key agents in public education and the roles they play in educational technology's growth and dissemination. Although each chapter will focus on the interactions between public education's parties and the specific technologies they use, the overarching emphasis is on Canadian researchers and the role they continue to play in education's development. This is not an examination of either technology or education in isolation; rather, it is an explanation of how Canadian academics have understood, commented on, and tried to improve on the introduction of educational technologies into Canadian schools. I believe the social sciences can play the keystone role in promoting sound, inclusive, democratic educational

policy. But first we must stop to look back at where we have been and what we have done. The educational technology debate is an ideal lens, as it incorporates public values and private agendas at every step. As Saul observes, public education "is the one place where lofty ideals and misty mythology cannot avoid meeting the realities of crude self-interest" (1992: 26). Educational technology – 'computers in classrooms' – evokes passionate responses from researchers of all stripes, affording a perspective on the ecology of knowledge in Canadian universities that is as unique as it is expansive.

The first major aspect of the debate I will consider is the relationship between computer technologies and Canadian society as a whole. This chapter will trace the origins of our current fascination (bordering on obsession) with the high technologies at the heart of modern educational technology. As I will show, this rise in techno-fetishism directly parallels the renewed currency of economic determinism in the Western world. Futurists, ideologues and corporate leaders recognized a series of world events as an extraordinary opportunity to promote twin visions of the future; in the process, they attempted (and, arguably, succeeded) to re-define the public good in economic terms, thereby transforming the purposes and practices of public education. Through an alliance of academic, corporate, government and military groups, our understanding of how human minds function has helped to acclimatize us to a model of public education designed to serve economic ends, rather than cultural, societal or democratic ends. Although the formation of such an alliance owes as much to coincidence as to any specific motive, the continuing propagation of the new economic model

has clear ideological underpinnings. As such, the role of public education in Canadian society is firmly linked to political and economic seats of power. Researchers need to focus on more than just the political economy and inherent ideologies of educational technologies themselves; the nature of public education itself, in its numerous manifestations and participants, demands critical reflection. The strength of technology's grip on public opinion, the nature of the growing attacks on public education's worth, and the endless rhetoric of the 'Knowledge Economy' and the 'Information Society' must be seen as not-so-distant cousins; they share common ancestry, and a thorough examination of the family tree will provide an important first step in re-establishing education researchers' ability to protect public education from its many detractors.

The next chapter explores the evolving relationship between educational technologies and the teachers who actually use (or don't use) them in Canadian classrooms. While the public perception and economic use of education has changed enormously over the past few decades, teaching practices have remained surprisingly resilient in a number of important ways. The greatest impact of the changing technological and ideological currents on teaching is arguably felt on the role that teachers play in education, rather than on the daily classroom practices that have constituted the profession for centuries. Specifically, two, seemingly opposing forces, are transforming the role played by teachers in education: professionalization and proletarianization. While the former points a spotlight on some of the most promising features of educational

technology, the latter is illustrative of computer technology's dangerous ability to standardize both work and culture.

As I will explain in greater detail, these two forces currently co-exist in Canadian teaching, threatening the enduring structures of resilience that have protected public education from previous technological assaults. Whereas many in the educational technology debate have tended to concentrate on how technology impacts the learning process, much more attention needs to be given to the role of teaching in public education. As an example, I will provide a detailed account of the various concerns regarding the future of literacy in a high-tech world. While much of the academic community's perspective has been startlingly conservative on this particular issue, there is much that can be learned from how teachers actually use technologies – of all varieties – when teaching literacy. Rather than simply defending the Great Books of Western Literature as inherently worthwhile curricular content, it is important to approach this issue, and all other educational technology issues, as matters of societal values and pedagogical methods. Mistaking the medium for the message prevents the type of multi-party discussion that will be essential to organizing collective resistance against deterministic thinking of all kinds.

The third major area explored in this thesis is the complex set of relationships between computer technologies and students. Although young people continue to occupy a central position in education research, changes in the social construction of childhood are making it increasingly difficult to discuss 'students' as a single category. Generalizations about young people and youth

culture further complicate research efforts, ignoring important forms of interaction between young Canadians and computer technologies. I argue that the productive abilities of contemporary educational technologies are bringing two cultural forces together in extraordinary ways. On the one hand, technological rationality encourages researchers and students alike to treat the learning process as an extension of a computer's basic functions, thereby shaping the metaphorical and linguistic terrain upon which future education research is conducted. Students' minds, conceived of as computers themselves, are seen to be ideally suited to learning from computer technologies, implying a paradigmatic causality where none exists.

The second significant force at play in the relationship between young Canadians and computer technologies is the notion of 'cool,' which is increasingly becoming a doppelganger of knowledge work in an Information Society. The cultural significance of 'cool' is highly relevant to contemporary debates within education research, as it draws attention to the various relationships engendered by computer technologies. Although the recent history of Western culture and cool is intimately connected to the machines and practices of mainstream economics, I believe the current conflation of cool with computer technologies radically undermines potential avenues of cultural expression and growth. Encouraging students to work with computer technologies in an educational setting further solidifies the growing link between public education and the corporate sector, as it prepares young people for a world in which the personal, the private, the public and the professional are all

contained in a single machine. Studying the genealogy of cool and its implications for young people can therefore provide education researchers with a vital overview of the cultural landscape that underpins the use of computers in classrooms.

These three chapters will demonstrate the need for future education research that can successfully navigate the complex terrain found at the crossroads of public education and computer technologies. In the final, concluding chapter, I will attempt to trace the boundaries of a research model that is inclusive, multi-disciplinary, anarchic, and accessible to the Canadian public. As I will argue, the public value of the social sciences in this country must be strengthened if university research is going to play a meaningful role in sustaining the highest possible quality of public education. I hope that this thesis demonstrates not only the complexity of studying educational technologies, but also the urgent need to improve current research practices within the field.

University researchers must recognize the importance of Canadian public education, not only as a field of inquiry, but also as a foundation of a democratic society. Without critical, progressive education research, the future of Canadian schools will be determined by corporate interests, military technologies, economic imperatives, and political motives. Should this occur, the future of social science research itself will be in jeopardy, as fewer and fewer students will be drawn toward the academic environment that currently protects and invigorates such university research. As Saul argues:

> The sensible thing for the university community to do now would be to turn away from its self-interest in order to take on a leadership role in the

> movement to reinvigorate and broaden pre-university education. They might discover that disinterested action of this sort would strengthen the role of the universities by pulling them away from collaboration with the corporatist model. Back towards the wider obligations of humanism. (1995: 175)

As a field of inquiry, educational technology must attract the attention and efforts of researchers from a variety of disciplines. Studying computers in classrooms has far more to do with competing visions of the future of Canadian society than it does with actual machines in schools.

CHAPTER 2:
COMPUTER TECHNOLOGIES AND CANADIAN SOCIETY

> *Canadians should stop pretending that education is not and should not be political. It is and it should be. Education is about realizing a society's vision. Different people prize different things and will seek to influence education to achieve their vision. By pretending that education isn't political, we diminish the importance of values in our vision for society. (Ungerleider 2003: 234)*

For the past three decades, sophisticated educational technologies have been knocking on Canadian classroom doors, seeking an opportunity to step inside and demonstrate their amazing pedagogical possibilities. Like any cunning suitor, however, educational technologies and their enthusiasts realized that the key to establishing a lucrative, yet legitimate relationship with young people is to seek parental approval. Simply put, if you can convince parents and other concerned adults that computers are essential to public education, dissemination is a *fait accompli*. The development of this belief – that computer use is at the core of public education's mandate – has taken years to properly work its way into the collective consciousness of Canadian society. Understanding where this belief comes from and how it has altered the political, educational, and economic landscapes helps us understand the stakes of the educational technology debate, and demonstrates the necessity of critical, coordinated response from members of Canada's academic community.

2.1 Technology and Society: Tools and Toolmakers

Although the development of personal computers and the Internet has undoubtedly had tremendous implications for Western societies, we shouldn't forget the social movements and cultural currents that have helped pave the way for technological development. As Saul argues:

> [Technology] is a matter of options, matching chosen means to chosen ends. Societies have often decided not to use technological breakthroughs made possible by science. After several experiments with gas warfare, most societies decided to abandon it. After dropping two atomic bombs, society dropped no more. (1994: 281)

This is not to say that our tools have no ideological significance; we may choose to believe that we control every stage of their development in a rational, considered manner, but it is often impossible to unwrap social forces from the technologies associated with them. Toxic gases and atomic bombs, as technologies, are inseparable from the acts of warfare that both engendered their development and witnessed their horrific deployment.

The process of technological innovation and development is ideological to its core, with human players and their inventions reinforcing each other's validity in a feedback loop that is now centuries old. The Enlightenment's project to rid humankind of its dangerous reliance on the unquestionable legitimacy of religious belief gave birth to an equally unquestionable belief: that science is an uncompromisingly rational process of human thought, which produces ideas and innovations (technologies) for human use in an equally rational manner. Consequently, as Stanley Aronowitz and Henry Giroux argue, advocates see current technologies as just another step in the advancement of Western

civilization, one that further frees science from the constraints of human folly; nevertheless, "this neutralization of technology reveals complete support for the scientific ideology of objectivity through experimental method and value-free research" (1985: 16). Arguing that computers themselves are simply tools in the service of Canadian society may divert blame for their misuse onto Canadian society as a whole (after all, if we all wanted computers to exist, then we must all take the blame for their every conceivable failure); but it also diverts any and all blame away from the scientific process itself. Understanding how sophisticated computer technologies have been developed, and how they have been introduced into public education, can be far more illuminating than simply studying their potential use in the classroom.

We design tools for specific purposes, we use them in specific contexts, and we perceive their usefulness in very specific manners. While specific tools may not control human behaviour in measurably deterministic ways, they can affect the ways in which their users think about the world around them. As Postman summarizes:

> It is extreme naïveté to believe that a medium of communication or, indeed, any technology is merely a tool, a way of doing. Each is also a way of *seeing*. To a man with a hammer, everything looks like a nail. To a man with a pencil, everything looks like a sentence; to a man with a television camera, everything looks like a picture; and to a man with a computer, the whole world looks like data. (1988: 33 italics in original)

The difficulty in discussing computer technology in thoughtful, appropriate terms is further compounded by the enduring 'newness' of computers in society, which has lead many to believe that computers are wholly unlike any other technology the world has ever known. Whereas the introduction of previous technologies

may have had unintended effects on society, computer advocates insist that things will be very different this time around. According to Oppenheimer, when "Today's technology evangels commonly argue that we've learned our lesson from past mistakes," what they are saying is that, "when today's technology (the computer) is compared with yesterday's machine, today's is better" (2003: 6). No matter how hard some true-believers may try to prove their case, it is ultimately most constructive (for all perspectives) to think of computers as tools. They may be among the most sophisticated tools ever built by humankind, but they are still technological inventions in the same tradition as older, simpler tools.

Thinking about computers as tools can either simplify our understanding of their educational impact, or it can complicate it, depending on how we think about the role of tools in everyday life. For example, many computer technology supporters, well aware of how complex the machines are, employ the language of more traditional technologies in order to pacify their critics. The most Janus-faced among them will breathlessly extol the impending global information revolution, while simultaneously assuring the public that a computer in a classroom is no big deal: after all, *it's only a tool.* As Susan Robertson keenly observes, "We use this expression when we want to distance technology from the choices we make and their consequences, or when we want to suggest that they are equally amenable to any task. It is true that tools can be flexible, but only within certain limits, since their design inevitably favours some applications, inhibits others and prohibits a good many. Hammers don't work well with screws – which doesn't mean that in desperation we don't give it a shot, especially if we

are novice carpenters" (2001:14-15). Hiding the computer's design history, communicative filters, and potential misuses behind the rhetoric of simple, old-fashioned tools greatly undersells both the advantages and disadvantages of educational technologies. Either computers are a revolutionary new technology re-inventing the world, or they are simply speedy typewriters, waiting for human operators to make them meaningful educational devices; given the choice between only two perspectives, it isn't surprising that education researchers have been arguing for thirty years. There is little value in referring to any technology, computers included, as 'only' a tool; most tools can be easily understood when considered only in regards to the specific functions they can aid. Broader questions of design and development, however, can complicate even the simplest of tools.

Computer technologies are particularly difficult to contextualize and theorize, as the umbrella term 'computer' covers an enormous range of devices and tools. The average personal computers available today can perform a spectacular variety of functions, and larger industrial devices can process information on an unimaginable scale. When educational technology researchers discuss the impacts of computers in classrooms, it is not always clear which tools they are considering. Consequently, generalizations in education research inevitably result in further complications and contradictions that will fuel further debate. Computer technology, writes Wotherspoon:

> Can stimulate interest, increase access to resources and programs, enhance innovation and flexibility, facilitate connections among educational participants, and ensure that education is attuned to emergent global trends. It can also work to the disadvantage of educators and

> learners who do not have access to or are unable to master technological developments. It may democratize access to information, but it can also contribute to centralized control, increased monitoring of individual activity, and limits to freedom. It can open up new employment and creative possibilities, but it can also contribute to the reproduction of existing social inequalities and the emergence of new dimensions by which more privileged groups come to distance themselves from the underprivileged. (2004: 267)

In order to better understand Western culture's fascination with such a nebulously defined category of human inventions, it is worth investigating how the general notion of computer technologies emerged in the public consciousness. How have these tools, developing from a variety of backgrounds and designed for a variety of purposes, come to occupy such a revered, yet poorly articulated space in Canadian society?

2.2 The Information Society and Historical Discontinuities

Each significant leap forward in the evolution of electronic technology has been accompanied by a host of optimistic futurists, who tell of the coming paradise to be ushered in by the latest technological curiosity. Television was to transform the face of society and make us all into fully engaged citizens in a democratic state. Early microcomputers were to eliminate the need for paper in the workplace, freeing workers from the drudgery of daily routine. Over the past three decades, however, the networking capacities of powerful new computers have been packaged and sold as the single most important force on the planet. The most recent wave of techno-enthusiasts haven't just promised great rewards for Western culture – they've promised us an entirely new culture altogether. Best of all, the rhetoric of the Information Age ensures that its faithful converts

will reap the greatest rewards; as Daniel Bell argues, one of the core dimensions of this new world – which he refers to as the Post-Industrial Society – is the "pre-eminence of the professional and technical class" (1973: 14). Those who embrace computer technologies will not only find employment in the new order, they will hold great power and authority, too. This is because the Information Age, in essence, is a meritocracy. As Bell argues, "Differential status and differential income are based on technical skills and higher education," and without these differences, an Information Age cannot function (1973: 409).

It should come as no surprise, then, that the combined power of computer technologies and frontier capitalism have ushered in a brave new era of prosperity and promise. Manuel Castells considers this 'Information Revolution,' with roots spanning back several decades, to have come into its own sometime in the 1970s, arguing that, "The rise of the network society [...] cannot be understood without the interaction between these two relatively autonomous trends: the development of new information technologies and the old society's attempt to retool itself by using the power of technology to serve the technology of power" (2000: 60-61). (Although by no means a member of the Information Society's true-believer vanguard, Castells has exhaustively catalogued the rise of this new era in human history, leaving the unadulterated speculation and prognostication to pure futurists such as Alvin Toffler [1974, 1980].)

The Information Age, in which we now apparently live, is positioned as an historical inevitability of rational, technological progress. Among the characteristics of this new paradigm are: "the *pervasiveness of effects of new*

technologies, [wherein] all processes of our individual and collective existence are directly shaped (although certainly not determined) by the new technological medium;" networking logic, which "seems to be well adapted to increasing complexity of interaction and to unpredictable patterns of development arising from the creative power of such interaction;" and flexibility, because "What is distinctive to the configuration of the new technological paradigm is its ability to reconfigure, a decisive feature in a society characterized by constant change and organizational fluidity" (Castells 2000: 70-71 italics in original). When presented in these terms, computer technologies appear to have the effect of casting holy light unto the darkest depths of human ignorance; the Information Age shapes our very existence, curtails and controls our inherent unpredictability, and even keeps track of the changes taking place around us of which we aren't even aware.

There is no longer any need to treat human life and technological innovation as distinct categories, as the Information Age eliminates artificial boundaries between tools and toolmakers, erasing any concerns about deterministic attitudes and practices. For Castells, "the dilemma of technological determinism is probably a false problem, since technology *is* society, and society cannot be understood or represented without its technological tools;" he goes on to summarize, "Technology does not determine society: it embodies it. But nor does society determine technological innovation: it uses it" (2000: 5 italics in original). The new society we inhabit, an Information Society, employs technological vernacular to describe human relations, as well as cultural

metaphors and constructions to describe technical structures; people and computers are simply equal participants in an unending web of networked interactions.

The rhetoric of the Information Society can be very seductive, because it posits all human activity as a node in the global network of culture and power. Gender, ethnicity, religion, sexuality – indeed, all the categories that distinguish human difference – way to the logic of pure, networked information. This type of thinking, however, uses the 'newness' of computer technologies to mask the 'oldness' of human societies. In his discussion of what makes the Information Society so fantastically unique in the course of human history, Castells cites the renowned scientist Stephen J. Gould, who advances an argument for 'gradualism,' stating that "The history of life, as I read it, is a series of stable states, punctuated at rare intervals by major events that occur with great rapidity and help to establish the next stable era" (qtd. in Castells 2000: 28). Applying the logic of gradualism to thirty years of computer technologies, Castells states, "My starting point, and I am not alone in this assumption, is that, at the end of the twentieth century, we lived through one of these rare intervals in history" (2000: 28). The revolutionary, transformative power of the personal computer and the Internet are so great, he believes, that "we are witnessing a point of historical discontinuity" (Castells 2000: 78). My concern, and I am not alone in this critique, is that one cannot accurately identify and describe a 'historical discontinuity' as it is happening. To do so is to believe that the enterprise in which one is currently

engaged is among the most significant undertakings in the history of mankind. As Saul warns:

> It is a general weakness of men delivering ideas that they are able to convince themselves their words represent a break with the past and a new beginning. In the early stages of a revolution, history is at its most malleable. Disorder and optimism combine to wipe out those truths artificially manufactured by the preceding regime. At the same time, they usually wipe out the memory of any inconvenient real events. (1992: 38)

The changes impacting Canadian society during the past thirty years, both social and technological, have undoubtedly been felt in every major area of daily life. To argue that these impacts have somehow re-written the underlying structures and ideologies of existence is as dangerous as it is foolish.

2.3 New Global Economics: Networks Rule the Planet

While techno-enthusiasts and cultural palm-readers may not have convinced us all that networked computers have forever altered the course of cultural and personal development, they have done a remarkable job of convincing those in power that our collective economic development is irrevocably altered. The logic and rhetoric of the Information Society have developed in tandem with those of the Knowledge Economy, which, when coupled with modern technology's ability to connect communities from around the world in a single communication web, has radically expanded the role and reach of Western capitalism. As computer technologies continue to develop at an extraordinary pace, the economies of all nations are now being asked to keep pace in any and every necessary way. What is deeply disturbing, however, is that

so many nations and cultures have willingly obliged. In the absence of a widespread critique of this new economic order, the idea of the Information Society has effectively hijacked global markets and re-branded them as networked components of the new Knowledge Economy. But is the current economic order really so unrecognizable from conditions found thirty years ago? "Is work today – including the digital products and services that the technology industry delivers, and the rules it lives by – so different from yesterday's horses and carriages, railroads and bridges," asks Oppenheimer, "that it constitutes a *new* economy?" (2003: 187 italics in original) Although computer technology has certainly spawned significant growth in a number of economic sectors (electronics production, customer support, office administration, etc.) it has not transformed the daily customs and routines of most people on this planet, nor does it show any sign of doing so in the coming years or decades.

"Maybe I've missed something," muses Oppenheimer, "but people still seem to be buying food, clothes, and houses, cars and trucks, heating oil and beds, and a good many other clunky things" (2003: p187-188). If we are living in a Knowledge Economy, then we have been doing so for quite a lot longer than most techno-evangels would like to admit. Our current economic model has felt the impacts of computer technology, but it has kept a number of its defining features intact throughout the entire period of change characterized as the Information Age. This is because, in strictly economic terms, the past thirty years of computer innovations have paled in comparison to the massive changes – industrialization, mechanization, etc. – of previous eras in Western history. The

Internet has yet to give one alliance of nations a tactical advantage over another in a global conflict; iPods have yet to topple stock markets around the globe; MSN Messenger hasn't resulted in massive forced human migrations. The resiliency of our core economic practices is hardly surprising, given the previous upheavals it has faced – it will take more than a classroom full of personal computers to unravel and transform a system that has withstood World Wars, Depressions, and Revolutions. This is not to say that significant changes haven't affected Western economies over the past thirty years. What does need to undergo further analysis, however, is the relationship between economic changes and technological innovation. Computer technologies have had a profound influence on Western economic practices, but to suggest that they have somehow re-written the rules of capitalism and ushered in an entirely new and unprecedented economic model is to severely underestimate both Western society and its economic stability.

When it comes to economics, the rhetoric of the Information Society (or the Knowledge Economy, or the Information Economy, or any other such moniker) imparts a decidedly deterministic influence upon the same technologies that we are told will have no determining impacts on education. Although computers are simply 'tools' for classroom use, the cumulative body of computer technology is seen to have driven economic changes that are actually quite unrelated (although not entirely independent). Whereas techno-enthusiasts in public education tend to claim that specific, identifiable human agency will direct the use of computers toward pedagogical goals, Knowledge Economy boosters

tend to hide political decisions behind the essential nature of technological development. Thus the actual economic crises of the past thirty years have allowed a particular ideological perspective to promote computer technology as a radical new force in global economics. Castells, for example, writes that the real cause of economic instability in the Western world for the past three decades is that the Keynesian welfare state "hit the wall of its built-in limitations in the early 1970s" (2000: 18). The result, he adds, "was the inability of the public sector to keep expanding its markets, and thus income-generating employment, without either increasing taxes on capital or fueling inflation through additional money supply and public indebtedness" (2000: 95). Such a reading of an historical problem allows for an equally curious analysis of its cure: "To open up new markets, linking in a global network valuable market segments of each country, capital required extreme mobility, and firms needed dramatically enhanced communication capabilities. Deregulation of markets and the new information technologies, in close interaction, provided such conditions" (Castells 2000: 96). Simply put, computers came around at just the right time to solve capitalism's problem with itself; the outdated welfare state needed to go, and computers came along to push it out the door.

This is, of course, an extremely one-sided analysis of a three-decade struggle to transform capitalism's role in the world. Privileging a technological perspective on the struggle – to the point of naming it the unanimous victor and even the sole contender – ignores a plenitude of social, political and economic factors. The changing nature of Western economies in particular owes far more

to shifting political terrain than it does to emerging computer technologies; although both have undoubtedly played a role in shaping contemporary society, it is critical to remember the role the state has played in the transformation of the welfare state. As Saul observed over a decade ago:

> After the economic crisis of the 1930s, we created a multitude of control valves and safety nets in order to avoid any future general collapse – strict banking regulations, for example, social security programs and in some places national health care systems. These valves and nets have been remarkably successful, in spite of the strains and the mismanagements of the last two decades. (1992: 11)

Using technological development to justify the dismantling of the welfare state may make sense to the techno-enthusiasts who stand to benefit enormously from deregulation and low corporate taxation, but it greatly limits society's ability to consider political decisions separately from supposed economic imperatives: do we really need to cut back on social services in order to sustain economic growth, or might there be alternatives? For the purposes of considering technology's impacts on public education in Canada, it is imperative that researchers investigate the driving forces behind modern economic change. The imperatives of the Knowledge Economy are no less ideological constructions than the imperatives of the welfare state; both are human constructions designed to serve specific social goals through specific institutions and practices. However, while the latter recognizes its roots in human history, the former paints itself as an inevitable outcome of technological development – an ideological necessity. The result, in public education as elsewhere, is a fundamental loss of human agency in the progression of human affairs. Our collective concerns and values, we are being told, must defer to the economic realities of the computer age.

2.4 National Interests vs. Private Markets

In Canada, one of the most visible impacts that Knowledge Economy rhetoric has had on society can be seen in public services such as education. In order to stay competitive in a global market, countries such as Canada must take a hard, economic look at any service currently provided by the state; technology, having re-written the rules of commerce and management, has changed the way in which we think about education, health-care, and other nationalized services, or so we are told. It should come as little surprise that many of the loudest voices in defense of the new economy's imperatives also stand to gain the most from government's re-appraisal of national public services. As Dobbin warns:

> The corporate drive for privatization has a simple motive: the huge areas covered by public services provide the single largest area for investment remaining in developed countries. Health and education alone would absorb hundreds of billions of dollars in capital investment in Canada. (1998: 234)

Public services such as education and healthcare may indeed be highly profitable opportunities for private sector interests, but only if they are radically transformed from their current state. Providing equitable public education to all Canadian students may be democratic, but it is hardly lucrative. As Larry Kuehn argues, this is because public services cannot be commodified and traded in a marketplace; rather, "We tend to think of them as social and cultural relations with a general overall cost, but not as segmented economic units" (1997: 69). Calls for privatizing public services such as education overlook the essential fact that educating a nation's population isn't meant to be profitable; criticizing

governments for losing money on public education makes as much sense as attacking them for spending money to hold elections.

The rhetoric of the Knowledge Economy attempts to standardize all human activities into equal, and thus comparable economic transactions. Consequently, teaching students is no different than assembling computer components in a factory; managing the entire enterprise of public education is no different than managing a Fortune 500 business: it's all a matter of inputs, outputs, efficiency and growth. Concerted attacks against Canada's public services have helped to shape the way in which Canadians think about economics in general, because they acclimatize us to the notion that anything and everything must be considered in purely economic terms. As a result, observes Saul:

> Growth, as we currently understand it, classifies education as a cost, thus a liability. A golf ball, on the other hand, is an asset and the sale of it a measurable factor of growth. A face lift is an element of economic activity while a heart bypass is a liability which the economy must finance. (1995: 152)

Getting Canadians to see schools and hospitals as economic baggage is a highly lucrative endeavour for those who seek to take over management duties in these sectors; the actual public relations effort needed to make the case, however, has largely been conducted at arms length. "As with other public services," writes Dobbin, "the groundwork for corporate incursions into education begins with a sustained assault on the effectiveness of public education. Corporate-funded think-tanks have led the way, with the Fraser Institute and the C.D. Howe Institute playing key roles" (1998: 239). These two organizations have helped to

shape public opinion regarding Canada's public services, employing economic methodologies where they might not be wholly appropriate.

As an instructive example of how Knowledge Economy rationale has attempted to hide private interests behind global inevitabilities, it is worth considering the role played by these Canadian think tanks in transforming education. The reports and studies published by the Fraser Institute regularly support increased privatization in Canadian schools, citing their own annual rankings of how various schools score on standardized tests. That certain private schools achieve higher scores on particular tests is provided as incontrovertible evidence that governments cannot effectively operate schools. Whether or not these private schools do in fact provide a higher quality of education is therefore judged solely from standardized testing. Quality education, when defined in these strictly empirical terms, becomes a question of good management, thereby strengthening the arguments made by various charter school advocates, private school owners, and third-party educational interests who wish to enter the potentially lucrative market of Canadian education. When the Fraser Institute publishes its annual school rankings, it sends the message to Canadians that every school scoring below the top spot is in need of improvement; teachers must work hard to raise standardized test scores, sacrificing any current practices that may stand in the way of this singular goal. When this message begins to impact educational policy and practice, the Fraser Institute's annual claims are legitimized. Furthermore, by concentrating classroom efforts on improving these test scores, teachers lose valuable time to address curricular

content not covered by the tests; focusing on next years' test scores neglects the pedagogical needs and goals of students in the present.

For their part, the C.D. Howe Institute has examined the economic viability of higher learning using an economic approach. As David Laidler argues, such an approach makes perfect sense, as schools are simply institutions that use "scarce inputs to generate valuable outputs; [...] the university sector is a capital-goods-producing industry, and is appropriately analyzed as such" (2002: 2). In a related study, the Institute's Jeffrey Smith asks Canadians to consider an educational system "in which schools set their own tuition in a competitive higher educational marketplace, and students shop for the school that best matches their needs in the context of a system of government-guaranteed student loans;" he goes on to note that "no obvious economic justification exists, in either this hypothetical regime or the existing one, for having government actually operate universities" (2002: 278). Furthermore, both think tanks tend to frame their studies in terms of a perceived crisis in Canadian education, with new models of governance advanced as the only alternative to current failures – "*Can the Market Save Our Schools?*" (Fraser Institute 2001), for example. These analyses of Canadian education create what Jean-Claude Couture refers to as the 'culture of insufficiency' – "a discourse that locates the *subject of the present* and the *present of the subject* as an impossible place to live and work" (1997: 152 italics in original). Like the futurist rhetoric of the techno-fetishists, the discourse of insufficiency emphasizes change and progress, at the expense of the present and the past: old economic models no longer apply, new technologies will lead

us to the promised land, we must never be satisfied with what we have. As Marita Moll summarizes, 'here' is a place we don't want to be, and 'there' is a place to which we really want to go (1997: 50).

The focus on where schools should be going does, unfortunately, extend well beyond the issue of standardized testing. Public education's role in Canadian society has also mutated over the past thirty years, thanks in no small part to the efforts of technology enthusiasts and corporate-funded think tanks. In a new global economy, all students (seen merely as future workers) must be prepared for the new world in which they will live. Failure to address the direct relationship between education and the Knowledge Economy will have dire consequences for all Canadians; as Castells argues, the logic of the network is such that no single 'node' may disconnect itself from the network without suffering catastrophic repercussions (2000: 147). The insufficiency of current educational practices, we are told, will affect students' ability to find work in the new Knowledge Economy, unless public schools become a site for increasingly technological learning and job-oriented training. Teaching specific technical skills to Canadian students may seem like a useful goal, but is somewhat incompatible with the very nature of computer technologies, which develop and change at an astonishing pace. Whatever skills an eight-grader learns today will be almost entirely useless by the time that he or she enters the job market.

Rather than considering only the short-term economic possibilities of public education, policymakers and concerned parties (be they parents or think tanks) need to recognize the broader social purposes of Canadian schools.

Public education does far more than produce future workers – it produces future citizens. Our system of public schooling, argues Charles Ungerleider:

> Is the principal vehicle for the acquisition of the values that distinguish Canada from other nations and Canadians as socially responsible, democratically inclined citizens. [...] There is no other place in Canadian society where people from diverse backgrounds regularly come together for significant periods of time during which they must learn to work together, respecting the differences among them" (2003: 294).

Focusing on economic indicators, standardized testing, and anything else that privileges education's insufficiencies over its democratic potential distracts us from addressing the deeper social issues to which public education is symbiotically connected. Teaching students how to type may decrease the training expenses of various businesses, but it will not eradicate poverty from Canadian cities; to do that, we will need a citizenship that is committed to social justice. Those who have the most invested in the promise of the Knowledge Economy tend to present technological innovation and economic re-structuring as the forces that will improve our lives. Occasionally, they admit that real improvements don't come in convenient packages. While on 'hiatus' from Apple Computers, Steve Jobs confessed that:

> What's wrong with education cannot be fixed with technology. No amount of technology will make a dent [...] You're not going to solve the problems by putting all knowledge onto CD-ROMs. We can put a Web site in every school – none of this is bad. It's bad only if it lulls us into thinking we're doing something to solve the problem with education. (qtd. In Oppenheimer 2003: 52)

The deeper processes of learning and growth that occur in public education require much more than fiscal adjustments and shiny new tools. The Information

Society's rhetoric, however, has also had a major impact on these processes themselves.

2.5 Military Requirements: Man-Machines, Metaphors and Minds

Corporate interest in public services has resulted in a re-definition of public education's role in Canadian society, but another re-definition that has affected education at an even deeper level for several decades has also capitalized on what the Information Society has promised. Contemporary educational technologies, although developed and marketed within the corporate environment which most benefits from the imperatives of a Knowledge Economy, actually originated within another environment, one that is just as ideologically dangerous to public education's democratic purposes. As Noble argues, in the process of developing specific computer technologies for learning, military research has changed the way we think about learning, teaching, and even the human mind. Due to particular military needs and wishes over the past several decades, an entire 'educational' apparatus has emerged independent of public education, with a particular focus on standardized training. With the development of contemporary computers and its ensuing Information Society ideology, training techniques and strategies that originated in the military have expanded their reach into public school classrooms, public education policymaking, and into public opinion. As Noble carefully observes, however:

> Military educational innovations have been incorporated into public school practice and research through a convergence of efforts and motives.

> These include education leaders seeking ways to improve the schools and to modernize their profession, military researchers seeking wider sources of support and laboratory opportunities, and commercial interests seeking to take advantage of new education markets. They also involve policymakers responding to public outrage over educational failure, and a population encouraged to believe in the prestige of science and technology, symbolized most recently by the computer. (Noble 1991: 3)

Military development of learning technologies has resulted in a fundamental shift in our understanding of what it means to be human, and of how computers function. Understanding how this shift has occurred is essential not only to the future of public education, but also to Canadian society at large.

First, it is important to distinguish the specific strand of military innovation that Noble argues has affected technology's relation to education; military research in the past several decades has incorporated an enormous range of approaches and disciplines, from quantum physics to genetics. Research in the field of cognitive science, writes Noble, "not only serves the military need for 'intelligent' automation and semi-automation, but also contributes to two roles of military human factors psychology: to understand and codify human cognitive functions, and to improve these capabilities according to the heightened requirements of high performance military systems" (1991" 47). These two psychological roles are of the utmost importance in modern military practice, because as the machines of warfare become increasingly sophisticated, the technical skills of their operators must develop in tandem. It is not enough to train soldiers to push buttons with machine-like efficiency; if a human decision can be codified and automated into the next generation of machine, then the possibility of human error decreases, allowing soldiers more time on the battlefield to focus

on more conceptual problems. At every intersection of human action and machine interface there is a potential for misuse, for misunderstanding; eliminating this potential requires soldiers and machines that think alike, so that there can be no mistake. Consequently, a key element in military thinking is the notion of the 'man-machine,' because, argues Noble, "it embodies the role of the human being within the military worldview of technological innovation and command and control" (1991: 36). Placing human beings on an equivalent level of concern and interest as machines has been critical to the development of the modern (American) army, but it also introduces the idea of seeing man and machine as equal, if not interchangeable components of a man-machine system.

Understandably, the bigger problem for man-machine designers is not the physical machine itself, but the processor of information (man or machine). How do you design information processing systems that best capture human thinking? The answer, writes Noble, is sometimes referred to as "AI in reverse" (1991: 183). As Gavriel Salomon argues, "intelligent computer tools can not only simulate human cognition but [...] humans can simulate computers' intelligence. That is, learners can internalize computers' intelligent tools and use them as cognitive ones" (qtd. in Noble 1991: 183). As the machine designers and cognitive scientists involved in military research began to work in the enormously lucrative market of public education, the logic of 'AI in reverse' appeared to be equally applicable in a non-military setting. Students need to learn a standardized curriculum, and computers offer a standardized medium for individual or group learning; conceivably, learning machines could be designed that present

information in exactly the same way that students best learn, bypassing the imperfect training methods used by teachers. In the process, the computers would ensure that all high school graduates acquire information in the same way, allowing future employers (including the military) to continue the process of standardized computer training.

Although the machines and practices employed in this 'learning' model were developed within the military for specific reasons (and for specific applications), the man-machine model has been openly embraced by both Information Society enthusiasts and Knowledge Economy promoters alike. To those who seek increased spending on educational technologies, the 'science' of man-machine rhetoric is highly appealing, because it characterizes human development (biological) and computer development (technological, and thus manmade) as fundamentally intertwined. As Bruce Mazlish (1993) explains:

> [There is a necessary] recognition that human biological evolution, now best understood in cultural terms, forces upon humankind – us – the consciousness that tools and machines are inseparable from evolving human nature. It also requires us to realize that the development of machines, culminating in the computer, makes inescapable the awareness that the same theories that are useful in explaining the workings of mechanical contrivances are also useful in understanding the human animal – and vice versa, for the understanding of the human brain sheds light on the nature of artificial intelligence. (qtd. in Castells 2000: 73-74)

We *are* our machines, and they are us; to keep them out of our own development (including our education) is to ignore our own nature.

The 'consciousness' Mazlish speaks of that ties together the natural and the artificial, however, is perhaps better understood in linguistic, metaphorical terms. The models and vocabulary we use to understand human experience

have changed throughout history: 'family trees,' 'setting down roots,' 'turning over a new leaf'; 'starting a new chapter,' 'filling in the blanks'; 'life is a journey,' 'reaching a fork in the road,' 'taking the path less traveled'. Nowadays, we use the language of computers and networks in our daily thoughts: we speak of 'multitasking', of the need to 'reboot,' of going 'online', and of 'making links', etc. Where Mazlish writes of *theories* to explain both man and machine, I believe he confuses lived language for scientific truth; although we may think of our brains as central processing units, this metaphor does not necessitate a literal comparison between the brain and the computer. There are certainly some similarities between natural mechanisms and technological ones, often at the level of functionality and perceived usefulness to a whole. These similarities, however, owe far more to human design than to any innate characteristics of machines. Just because a computer's CPU relates to its peripherals in a manner that is symbolically similar to the brain's control of the body, this perception of verisimilitude does not require us to see the two processes as necessarily congruent, related, or parallel.

The study of computer science aids in the design and use of highly sophisticated technologies, many of which will ultimately improve or enhance some aspect of our daily lives. To transfer the methods, theories, or fundamental assumptions of computer science to the field of cognitive science (or vise versa) is rather insulting to humankind and its abilities; we must never forget that which distinguishes our minds from the machines we use. Attempts to replicate the human mind in technological form present an opportunity to better understand

the unique conditions that makes us human. Attempts to explain the human mind in technological terms place highly predetermined limits on what we are and what we can do.

The metaphors of learning and thinking that have emerged from decades of military research are woefully inadequate in explaining the mental capacities of Canadian students; while they may be useful in the design of sophisticated new military hardware, they simply cannot be transferred to public education. Public schools are concerned with education and development, while military-style computer-based learning emphasizes rote training and standardized behavioural patterns. What is missing in the man-machine model of learning is the centrality of knowledge in human development; knowledge, writes Saul, "is neither information and expertise nor an instruction manual. It is an investigation of the human as a whole being in search of doubt; an unlimited desire to understand" (1992: 423). Although the metaphors of human experience in the Information Society undoubtedly alter our perception of both the human mind and of computer technology, the temptation to let these metaphors guide our economic, educational, and cultural lives must be resisted at every turn. As Noble argues, to the extent that "public education aligns itself with the supposed new 'intellectual' requirements of the information economy, it is to that extent further saturating itself with the militarized redefinition of mind, intellect, thinking and learning" (1991: 191). Just as the supposed economic necessity of aligning educational goals with corporate interests reflects a particular ideology of power, the military paradigm's appearance in contemporary education discourses represents a

dangerous legitimization of Knowledge Economy rhetoric. Severing the man-machine link allows us to focus on the most important issues at the heart of the educational technology debate, because it forces the recognition that there is only one relevant party to consider; computers are not an equal party, no matter how much of ourselves we want to perceive in them.

2.6 The Role of Education in Canadian Society

The final area for investigation in this chapter on technology and Canadian society is the manner in which computer technologies have affected the fundamental value of public education for Canadian citizens. Because computers have changed our perception of economics, cultural life, and even of the learning process itself, they have also helped to shape our ideas of how public education shapes our employment opportunities, our lifestyles, and our ability to imagine the future. Schools play a central role in the lives of most Canadians, and "For many people," write Aronowitz and Giroux, "schools occupy an important but paradoxical place between their daily experiences and their dreams of the future. In one sense, public education has represented one of the few possibilities for social and economic mobility" (1985: 211). Public education's ability to provide such mobility, however, is no longer as widely perceived or as appreciated as it once was. In an Information Society, the pace of technological change leads many to believe that traditional educational models are incapable of keeping up; the idea of spending twelve years reading, writing, and learning arithmetic seem somewhat quaint in an age of knowledge work. In the process of spreading the

Information Society gospel, technology enthusiasts over the past thirty years have largely succeeded in convincing the Canadian public that public schools can no longer teach antiquated, Industrial Age curricula.

So why have so many Canadians been so receptive to the chorus of calls for educational reform, particularly of a technological variety? As Ungerleider explains, at the same time as the computer industry was growing in strength and size, "Canada was faced with depleting natural resources and increasingly uncompetitive industries. An economy in which knowledge was the chief commodity presented seemingly limitless and environmentally clean promise" (2003: 117). Re-aligning public education's practices and goals so as to fit with technological development allowed educational administrators and policymakers to appear both forward-thinking and fiscally responsible; the cost of putting computers in classrooms was nothing compared to the fantastic riches to come in a Canadian Knowledge Economy. Public education's place in Canadian society could no longer ignore growing economic crises in order to promote purely utopian democratic ideals. Convincing voters, taxpayers, and especially parents that children would benefit from more educational technology accomplished two goals at once: it helped to open the educational market to massive corporate investment, and it helped soothe public concerns about Canada losing its competitive edge in the global economy (a concern which, if not created by technology enthusiasts, certainly met no significant resistance from their ranks). Initiatives such as the TeleLearning Network of Centres of Excellence have helped to sustain the belief that technology must play a part in

Canadian education, arguing that computers will always be an essential part of the work world. As the Network's own Linda Harasim observed in 1994, a love of learning is hardly a new concept; what is new, she notes, "is the *economic importance of lifelong learning*" (qtd. in Gutstein 1999: 211 italics in original). Guiding Canadian students into the logic, structure, and rhetoric of the new Knowledge Economy appears to benefit everyone involved: students will find lucrative jobs, businesses involved in educational technology will prosper, and the Canadian economy will flourish. Such a scenario, however, overlooks some very important factors in Canadian society at large, and in public education specifically.

The belief that technology-enriched education will benefit Canadian students relies quite heavily on the Information Society's argument that the nature of work has changed irrevocably over the past thirty years. While fundamental economic practices still continue to dominate Western economies (as discussed above), what has actually changed in many economic sectors is the significance of an employee's educational history. As computer technology changes, many employees find themselves in skills workshops and training seminars; that this form of specific technical learning has been framed as 'education' is understandable (given the military history of learning technologies and their incursions into public schools), but it is by no means accurate. The notion of 'lifelong learning' that has emerged from Information Society rhetoric imagines itself as an extension of public education's mission: Canadian citizens will continue to acquire knowledge throughout their lives, owing to the abundance

of information available and the ease of access offered by computers. That a Microsoft training seminar offered at an insurance company is not entirely similar to critical literacy education seems to have escaped notice. The belief that 'lifelong learning' is vital to success, however, has burrowed deep into public opinion. As Peter Liu explains:

> To be a white-collar or salaried worker in the 1950s, for example, was to stake the entirety of one's authority not on the self-owned property, business, goods, or money of the predecessor entrepreneurial classes of the nineteenth century, but on an existentially anxious property of 'knowledge' that had to be re-earned from scratch by one's children. [...] But to be a professional-managerial-technical worker now is to stake one's authority on an even more precarious knowledge that has to be re-earned with every new technological change, business cycle, or downsizing in one's own life. (2004: 19)

Faced with the prospect of an ever-changing economic landscape, it is not surprising that Canadian parents would want their children to acquire every possible advantage from the classroom. If computers can provide students with the skills needed to succeed in a Knowledge Economy, then computers they shall have.

Unfortunately, the notion of lifelong learning employed in the defense of educational technology shares a number of potentially dangerous characteristics with the rhetoric of the Knowledge Economy. Firstly, lifelong learning implies that, in order to fit seamlessly into established learning patterns, the 'educational' requirements of employers must be given serious consideration when designing curricula in public education; in order to master lifelong learning habits (and thus remain competitive in the global economy), Canadian students need to learn 'lifelong learning' while still in school. The threat to Canadian culture and

autonomy is almost unavoidable; as Moll explains, "Canadian education, Canadian values and Canadian sovereignty are all dispensable in a world where public services are rapidly being privatized, private services are rapidly going global, and education is viewed as crucial to the strategic interests of trans-national corporations" (1997: 47). The Information Society's rhetoric poses a serious threat to cultures around the globe, and not all countries have the relative economic clout that Canada has enjoyed over the past thirty years. Faced with the prospect of technological expansion on a global scale, it is imperative that nations and communities work to protect the practices and customs most susceptible to the global Knowledge Economy's bulldozing effects. Despite the overwhelming force of the Knowledge Economy's rhetoric, writes Kuehn:

> We must not let ourselves be overwhelmed. The alternative is to keep focused on the politics of possibility, taking the individual and the collective actions that are true to the ideals of public education – actions that support democratic participation, as well as personal development and social justice for our students – and for the society that we share. (1997: 75)

Many Canadians may need to learn specific technical skills throughout their careers, but there is no reason that they cannot acquire these skills on the jobsite as necessary. Reforming public education in a way which privileges technical skills over broader educational values allows economic priorities to subordinate cultural needs and desires, and it threatens whatever may be unique about Canadian public education. Our educational practices and programs have developed over decades, and we cannot ignore the very real possibility that a great deal of our cultural identity – what makes us who we are – has not only found its way into public education, but has also been sustained and proliferated

through education. Through our schools, we may in fact learn to be Canadians, whatever that may entail.

The aspect of Canadian public education that ultimately suffers the most in an Information Society is, ironically, our collective ability to imagine the future that public education offers. Although the pace of technological development and its effects on daily life continue to amaze us, the desire to link educational practices to specific forms of knowledge work greatly limits the ways in which we imagine the future. Rather than preparing Canadian students for an unknown world in which they will live and work, educational technology enthusiasts are training them for a pre-ordained, monotonously static work world that appears as the logical extension of current practices. As a result, many students tend to see their education as nothing more than the vital stepping-stone to employment, financial security, and prosperity; as David Brooks observes, our current educational model:

> Encourages a professional mind-set in areas where serendipity and curiosity should rule, but it does not give students, even the brilliant ones at top schools, an accurate picture of the real world of work. And if these students are myopic about career prospects, you can imagine how unprepared they are to imagine what a human life should amount to in its totality. (2004: 183-184)

Although the loss of specific cultural practices in Canadian schools is a cause for concern, the decline of imagination among Canadian students (and among the Canadian public in general) is a far greater loss. Once public education becomes nothing more than the training arm of the Canadian economy, we will have lost a vital space for imagining alternatives, exploring possibilities, and envisioning a better world. The deterministic power of the

Knowledge Economy assures us that computers are the future, and that public education, once re-invented as public training, will keep individuals and nations competitive in a global network of information and commerce. "The much-heralded death of dreams and utopia," writes Freire, "which threatens the life of hope, ends up making educational practice despotic, thus hurting human nature. [...] If dreaming is dead and so is utopia, educational practice has nothing more to do with denouncing perverse reality and announcing a less ugly reality, one that is more human" (2004: 110). As Canadian citizens, our relationship with computer technologies has a tremendous impact on the practices and outcomes of public education. Without an ongoing analysis of how we perceive technology (and of where these perceptions originate) education research cannot escape the ideological boundaries established by Information Society enthusiasts.

CHAPTER 3:
TEACHERS AND TECHNOLOGY:
RESILIENCY AND CHANGE IN THE PROFESSION

> *If we are going to face the task of developing the ideological and material conditions from which radical educators can rethink the project of schooling and human emancipation, then surely we cannot accept either the near hysterical description of education as providing human capital to commerce or socialization models that speak to the limited task of transmitting dominant culture to succeeding generations.*
> *(Aronowitz & Giroux 1985: 20)*

Computer technologies continue to shape the world around us, changing the ways in which Canadians think about business, culture, and public services such as education. Yet within the debates concerning educational technologies there is rarely enough consideration given to the crucial role played by teachers themselves. Educational policy can help bring computers into classrooms, and curricular reform can introduce new technical training initiatives, but actual classroom learning still relies on individual teachers in schools; without sufficient approval and endorsement from teachers' groups, many educational technology efforts won't reach Canadian students. While many teachers welcome sophisticated new tools into their pedagogical approaches, technology adoption depends on a number of factors, each of which must be addressed by education researchers studying computers in classrooms. Although the changing nature of teachers' work in the Information Society has made it easier to introduce educational technologies, the actual work done with computers in classrooms may surprise both critics and enthusiasts alike.

As noted in the previous chapter, education in a global 'Knowledge Economy' serves economic, rather than democratic purposes; teaching and learning give way to instructing and training, in order to acclimatize future workers to the realities of 'lifelong learning.' Faced with such a radical change in their profession, it is critical that teachers should be at the centre of the educational technology debate – not only to protect their livelihoods, but also to defend the value of pedagogical practices that are decades (and in some cases centuries) old. Discussions around school reform, computer learning applications, and the privatization of public education cannot occur without the input and guidance of those most deeply involved in public education. Teachers matter because they exert an enormous influence on future workers, voters, and consumers; as a result, argues Robertson, "The state has placed teachers, as producers of new forms of labour, social stability and political legitimacy yet with their own power to reason and ability to organise politically on a large scale, at the centre of state restructuring" (2000: 6). Accordingly, governments and education administrators have recognized the importance of bringing teachers on board before launching major technological incursions into classroom practice; without significant support from within teachers' ranks, restructuring faces a potentially rough ride. In order to build support within the teaching community, technology enthusiasts have had to convince educators that computers are not only indispensable tools for future workers in the Knowledge Economy, but that they are also empowering instruments for the teaching profession itself.

Shaping the contours of this profession, however, has been a highly contested affair for several decades, and additional complication from Information Society advocates has only further muddled matters. "Controlling the terms and conditions of their labour has never been a straightforward nor, indeed, unitary process for teachers," argues Robertson; "Rather, the nature of teachers' work and their class location has been the outcome of a history of struggles which has been shaped by the politics of social class, gender and race, and which continues in myriad (albeit different) ways today" (2000: 3). As central players in a highly visible public institution, teachers must contend with competing demands and criticisms from a wide variety of directions. In the process of navigating these currents, teachers define their own role in Canadian society, depending on the social conditions at any given moment. In the context of Knowledge Economy imperatives, it becomes increasingly difficult for teachers (and, indeed, for most workers) to define the terms of their own work without considering the role played by technology in Canadian workplaces. In the case of teaching, however, the increased influence of global technology has resulted in two, seemingly contradictory social forces. Understanding how they evolved and continue to interact effectively illustrates both the human impact on computer technology and the creative possibilities of their use.

3.1 Professionalization and Proletarianization: One Coin, Two Sides

Ever since the creation of publicly funded school systems in Western countries, teachers have had to defend their work as a legitimate practice. As a career path, teaching offers many incentives (relative job security, fairly predictable hours and salary, creative work with young people, etc.), but it cannot yet offer the type of authoritative, culturally legitimated respect found in other sectors (medicine, law, etc.). Teaching in public schools has been belittled and trivialized, at times compared unfavourably to babysitting, nannying, and other forms of labour that have traditionally been regarded as 'women's work.' Even today, teachers must be prepared to deal with the educational, psychological, and emotional needs of their students. As Wotherspoon argues, "these aspects of teaching are often devalued and discredited as real skills because of their parallels with mothering and domestic labour, forms of unpaid labour that are considered natural" (2004: 143).

In the early years of the twentieth century, male-dominated Canadian governments sought to control teaching practices to ensure that the women teaching Canadian children worked within strict boundaries. As Wotherspoon argues, teachers had to prove to Canadian lawmakers that they could in fact be trusted with the responsibility of 'managing' a group of children; over time, a system of regulations and standards developed to further monitor and restrict what teachers could and could not do in schools (2004: 153). Efforts to legitimize the professional status of teachers' work have had to overcome cultural obstacles, but significant progress has been made over the past century. The

resiliency of public education's core pedagogical values is due in no small part to teachers' hard earned control over their own classroom practice. The past thirty years, however, have produced a new threat to the nature of teachers' work. Although Information Society proponents claim to support the move towards professionalization in education, their fundamental assumptions about public education, as seen in the previous chapter, are somewhat suspect. Computer technologies will certainly allow teachers a higher degree of professional control and authority, insofar as 'teaching' consists of technical training and standardized instruction.

Actual teaching, as it currently exists in Canadian public schools, may in fact feel the effects of proletarianization, in addition to those promised by professionalization, when computers are introduced into classrooms. While the movement towards greater professional autonomy may seem incongruous with the movement towards de-skilling, layoffs, and standardization, "proletarianization and professionalization," writes Wotherspoon, "are not necessarily mutually exclusive;" (2004: 152). As a result, teachers often find that with an increase in workload comes increased specialization, and far less latitude for creativity; the 'professional' skills associated with computer use may in fact result in long hours spent on menial, repetitive tasks. This is because professionalization and proletarianization have evolved over the past few decades as two related aspects of Information Society logic: computer technologies offer the promise of individual and collective advancement, just as long as we're all using the same operating system. In a perfect Information

Society, all knowledge workers are equal, because all knowledge workers are more equal than others.

3.1.1 Professionalization and the State: Teaching the World to Sing in Perfect Harmony

While increased professionalization among Canadian teachers certainly benefits teachers themselves, it is important to understand how this process can also work to the advantage of the technology enthusiasts and corporate interests behind Information Society rhetoric. Although a public education system in the service of a Knowledge Economy would clearly serve the interests of high-tech employers, churning out cohorts of skilled workers accustomed to the demands of lifelong learning, the current system also plays a key role in maintaining the architecture and authority of economic and political power. Public education already contributes to the logic underpinning the Information Society and the Knowledge Economy because, writes Michael Apple:

> [The school must] make legitimate a basically technical perspective, a tension of consciousness that responds to the social and intellectual world in an acritical fashion. That is, the school needs to make all this seem natural. A society based on technical cultural capital and individual accumulation of economic capital needs to seem as if it were the only possible world. (1990: 83)

Although the actual content of the curriculum does matter in debates over reforming public education and its role in Canadian society, 'how' teachers teach is arguably of equal or greater importance.

The introduction of computer technologies into public education affects the move toward professionalization in two significant ways. First, it problematizes

the role played by teachers in Canadian society, as the hidden, cultural curriculum of classroom practice now threatens to exacerbate economic disparities. The Information Society's proponents may claim to help professionalize teaching through the miracle of educational technology, but they are actually forcing Canadian teachers to make critical decisions about pedagogical practice, without always providing the information needed to be equitable or fair. Encouraging teachers to communicate with students and parents by email, for example, seems to take teachers' best interests to heart: email allows teachers to share assignments and respond to questions on their own time, rather than confining them to their desks for scheduled appointments. The hidden lesson of increased email use, however, is that students without access to personal computers at home are less important to the teacher. Without a recognition of the real issues of access and ability that continue to flow along social, economic, ethnic, and racial divisions, teachers risk alienating the minority of students who haven't kept pace with technological development. (The notion of the 'digital divide' does not simply disappear with the introduction of computers into classrooms; disparities among student and teacher populations, in one form or another, are essentially unavoidable. As long as some students have access to more sophisticated technology than others, there will be some type of 'divide' that needs to be addressed.) The teachers and students who do have access to personal computers at home eventually come to see technical skills as perfectly legitimate expectations of the public education system; Canadian universities

have long since crossed this threshold, and the K-12 system appears to be following.

The second concern raised by educational technology in the effort to further professionalize Canadian teaching is the manner in which public education's hidden curriculum is both presented and interpreted. Although Canadian schools continue to serve the hegemonic needs of established authority, the process can certainly be streamlined and improved. For those seeking to transform public education into a system of technical training for the global Knowledge Economy, one of the major hurdles to overcome is the system's dependency on individual, human teachers. Pitching computer technologies as valuable tools for the modern, professional public school teacher thus kills two birds with one stone; classrooms begin to function more like the corporate training facilities they are supposed to resemble, while the authority held by the teacher at the front of the room begins to migrate into the machines themselves. Hidden curricula in public schools are transmitted through the structures of learning, rather than the content itself, and students receive these lessons from significant figures in their lives. To modify the structure of learned authority, argues Apple, "students' perceptions of to whom they are to look as holders of 'expert knowledge' must be radically altered" (1990: 102). The spread of computer technologies, presented as a means to further professionalize their work, may be substituting teachers' pedagogical authority with that of rational, logical machines.

The social order presented in Canadian classrooms today continues to reflect the prevailing conditions Apple identified in 1990, but now the potential for recognizing authority's subjectivity has greatly dissipated. Students seeking 'expert knowledge' know better than to ask the person at the front of the room; although teachers' words can be questioned, debated, and dissected, the computer is always right. As computers become the dominant 'significant other' in Canadian public education, students learn that authority figures are always right, because they are designed that way. Armed with the latest computer technology, teachers are left with the façade of professionalism and the duties of a skills workshop instructor.

3.1.2 The Dark Side of the Coin: Time, Money, Us & Them

Throughout the recent, technologically enhanced period of professionalization in Canadian teaching there has been a parallel rise in de-skilling and standardization. This process reflects a general shift towards proletarianization, which Wotherspoon defines as "the process whereby teachers, like workers in many industries, are subject to increasing, externally driven forms of control and pressures to intensify their work" (2004: 146). The particular Information Society model of professionalization, which strengthens technocratic authority at the expense of teachers' pedagogical autonomy, has allowed proletarianization to sneak into the classroom and undermine the potential professional gains promised by computer technologies. The same tools that have allowed teachers to update and expand their lesson plans, and to

enhance communication among students and colleagues, have also introduced and enforced an unprecedented level of standardization and routinization. Teachers have become increasingly dependent on technicians for technological support, and on technology designers for pedagogical direction. If the computers aren't working properly, classroom learning grinds to a halt; if the computers can't perform a specific function, then it can't have been overly important to the lesson in the first place. This increased level of dependency undermines a teacher's ability to design lessons and apply them in the classroom, further eroding the professional status of the teaching community. As Aronowitz and Giroux argue, teaching "is being increasingly situated within a technical and social division of labor that either reduces teachers to the dictates of experts removed from the context of the classroom, or serves to widen the political gap between those who control the schools and those who actually deal with curricula and students on a day-to-day basis" (1985: 24). Although the allure of increased professionalization has convinced many Canadian teachers that computer technologies benefit their work, the repercussions of such a widespread level of de-skilling have almost certainly overshadowed any actual gains in status or ability.

The move towards mass de-skilling among teachers, like so many other processes in public education, has been exacerbated by, rather than created by, recent developments in computer technologies. Standardized curricula have developed over several decades in Canadian education, in an effort to ensure that similar levels of education are offered across the country. In order to deliver the same types of lessons to students in thousands of different classrooms, an

enormous volume of standardized educational materials has been developed by an enormous number of authors and businesses. Although these educational materials have assisted in public education's democratic desire to deliver comparable programs to all Canadian students, they have done so largely at the expense of teachers' ingenuity and creative skills. As Apple (1995) observes:

> With the large-scale influx of prepackaged material, planning is separated from execution. The planning is done at the level of the production of both the rules for use of the material and the material itself. The execution is carried out by the teacher. In the process, what were previously considered valuable skills slowly atrophy because they are less often required. (qtd. in Moll 2001: 54-55)

The loss of these valuable skills represents a significant transformation in the nature of teachers' labour, slowly eroding the professionalism that teaching has developed over the years. This is not to say that the availability of prepackaged educational materials has made teachers lazy or unsure of their abilities. The risk of proletarianization only becomes noticeable when additional external demands are coupled with the influx of prepackaged materials. As Wotherspoon observes, the likelihood that teachers will "come to depend on prescribed materials (if, indeed, they are not overtly directed to adopt these materials) increases as class sizes and demands on their time grow" (2004: 148-149). Faced with ballooning workloads (caused in part by the same technologies that promised them more leisure hours in a day) teachers may turn to prepackaged materials, particularly those that can save them the most time. Although this process affected Canadian teachers long before the development of the personal computer, "the added pressure of dealing with pre-packaged material in electronic form," argues Moll, "will widen the gap between teachers as partners in the planning and design of

curriculum and teachers as implementers of someone else's plans, procedures and evaluative processes" (2001: 59). For many teachers, there simply isn't enough time in a day to both design and implement lesson plans for thirty-five students; given the choice (which they aren't) it is easy to see why teachers would be willing to farm out the design aspect of their work. In the process, however, they have had to sacrifice an important component of their profession.

In addition to the de-skilling of teachers' work, the proletarianization process has greatly enhanced the visibility and responsibility of both educational administrators and educational resource developers. Like their predecessors in previous waves of proletarianization (Taylorists, Fordists, and other scientific management gurus), those who have come out on top through teacher de-skilling tend to be corporatists, bureaucrats and specialists. As Aronowitz and Giroux observe, it comes as no surprise that public education is the latest beachhead for Knowledge Economy proponents to introduce technological and administrative controls over workers; just as the role of teachers in public education has been transformed in order to accommodate the demands of lifelong learning, so too has the role of the public education bureaucrat been transformed to more closely resemble that of a corporate manager, or a "social science expert" (1985: 27).

Armed with the latest management techniques and learning technologies, education 'experts' have made themselves increasingly indispensable in Canadian schools, transforming teachers' work in the process. The proletarianization of teaching work assures one labour group that their interests will be furthered by increased investment in educational technology, while it

further establishes and entrenches the authority (and, arguably, the professional status) of another. Unfortunately, the tendency to privilege administrative and technical imperatives in public education, argue Aronowitz and Giroux, "is part of a much larger problem within western societies, a problem marked by the increasing division of intellectual and social labor and the increasing trend towards the oppressive management and administration of everyday life" (1985: 24). The implications of such 'oppressive management and administration' for Canadian schools would be ominous at best, were it not for the teachers themselves.

3.2 Resiliency and Change in the Classroom

Despite the difficulties of professionalizing discourses and proletarianizing conditions, Canadian teachers continue to exert an important influence over the project of public education. Although educational technology and its uses are linked to discourses of change, progress, and innovation, public education itself remains relatively conservative, inasmuch as it preserves and imparts collected cultural knowledge. As the site where Canadians send each and every generation to learn and develop into citizens, schools have developed and maintained a certain degree of resiliency toward rapid change – be it social, technological, or economic. As Oppenheimer argues, there is a "hard core" to education that is "immovable;" as a result, he notes:

> Some of the system's habits (the firm divisions between subject areas; the superficial, fact-laden nature of tests, and sometimes of the curriculum itself; the dusty, deadly quality of most teacher-training studies) would

> make little sense in a more ideal world. Others [...] appear to make little sense, but they actually do – once we remember the schools' enormous job and the public and political demands for measurable scholastic progress. (2003: 24)

The resiliency of public education has, for better or for worse, allowed teachers to exert significant influence over how policy is implemented, how social movements are interpreted, and how new technology is used in the classroom. For the technology enthusiasts of the Information Society, teachers' resiliency is often perceived of as old-fashioned stubbornness. To many social science researchers, teachers are modern day Luddites, battling against the technologies that threaten their livelihoods. Actual classroom use of educational technologies, however, tends to reflect a variety of competing interests, as well as a variety of teacher personalities; it may be possible to track overall trends in computer use, but it is difficult to make many generalizations about these trends, no matter how much we may wish to use teachers' experiences to further our own causes.

What can be said with some degree of certainty is that Canadian teachers, as a whole, are becoming increasingly familiar with computer technologies, in both professional settings and personal life. Therefore, while the rhetoric of the Information Society must address the history and structures of an established system of public education before it can significantly transform the teaching profession, dealing with teachers as individual citizens can be an equally effective tactic. Teachers may be professionals in the classroom, but they are also voters, consumers, spouses, and, in many cases, mature students. Many young Canadian teachers working in classrooms today graduated from universities where computer use was a part of their daily routine. If teachers

choose not to adapt these skills to their current work environments, it is doubtful that they do so out of fear or ignorance. The resiliency of teaching practices has kept educational technology on a relatively short leash because teachers – well aware of what computers have to offer – must consider how new tools will affect the work they do at present. As David Livingstone argues, public education's "many publics continue to insist that the schools pursue several inherently contradictory goals – that is, socialize all children, but nourish individual creativity; teach the best of past traditions, yet ensure that each child possesses currently marketable practical skills; demand obedience to authority, but encourage critical thinking and questioning; cultivate co-operation, but prepare children to compete" (1997: 103). Given such an enormous set of demands, it is hardly surprising that teachers are cautious when introducing new tools and techniques to the classroom.

Nevertheless, computer technologies do get used every day in thousands of Canadian classrooms. Despite its tendency towards conservativism and resistance, the teaching profession is also well aware of its responsibility to prepare future citizens for the world in which they will live. Although this responsibility is markedly different from the training-oriented model of lifelong learning, public education does play an important role in encouraging technological development, just as it can encourage political change, artistic and athletic achievement, and social progress. Accordingly, many teachers have embraced educational technologies in their classroom practice, using computers in a variety of different ways to enhance both teaching and learning. As

Ungerleider argues, however, changes in classroom practice have not been as 'radical' or 'transformative' as many would have us believe; teachers use computer technologies for specific purposes because they, like the rest of us, "will adapt easily to new practices that they regard as equivalent to existing practices" (2003: 118). Using computers to complement existing lesson plans, for example, maintains a certain sense of pedagogical familiarity, while enhancing particular elements of the lesson, such as multimedia examples and ease of accessibility.

On the other hand, the types of learning technologies favoured by lifelong learning proponents overwrite existing pedagogical structures and practices. Wotherspoon argues that it is crucial to distinguish "between the use and impact of technologies as they relate to individual learners and educators, and those associated with education systems or processes as a whole" (2004: 261). Although some critics of computer technologies worry that the large-scale introduction of computers into classrooms will inevitably result in changes to the system as a whole, it is incorrect to assume that this is the only possible outcome. As Wotherspoon argues:

> In the extreme, information and communications technologies suggest an imperative for new paradigms based on drastic alterations to our whole way of thinking, learning, interacting, and living. Information technologies are commonly posed as inescapable realities that set the pace and standard for work and socio-economic survival in the emergent global scheme of things. (2004: 261)

Such an extreme position, although not entirely without grounds for concern, greatly diminishes the role played by teachers in public education. Left to their own devices, Canadian teachers will undoubtedly continue to introduce

computers into their classrooms as they see appropriate. The profession's ability to incorporate change in a meaningful way predates the rise of the Information Society. As an illustration of how various parties have both exaggerated the threat of computer technologies and ignored the importance of teaching's resiliency, I will explore the issue of literacy in the computer age. Nothing strikes fear into the heart of education scholars like the decline of literacy, or the 'death' of the book. Reports of literacy's death, however, have been greatly exaggerated.

3.3 Technology and Literacy: The Great Books' Last Stand?

As computer technologies continue to proliferate in Canadian classrooms, many critics worry that technical training is replacing older, more important curricular content. While technology proponents counter that skills development (such as typing and computer programming) is merely a supplement to traditional education, there is a risk that the supplements will eventually replace the fundamentals. As Oppenheimer writes, this is "like stocking a school lunch cafeteria with cake and cookies and candy and saying that the sweets aren't meant to discourage students from eating the salad and potatoes at the end of the buffet; they're only a 'supplement' " (2003: 140). Such are the fears of many critics in the educational technology debate; given the choice between books and computers, most students (and far too many teachers) will opt for the new, the flashy, and the morally bankrupt machine. Once school administrators allow computers into classrooms, educational practice will be doomed to chasing

trendy fads and catering to the attention spans of the television junkies sitting at computer workstations. Although ideologically distinct from their opponents in the Information Society camp, critics who follow this line of thinking are guilty of the same sorts of generalizations and misinterpretations of public education and its function in Canadian society. Understanding the ideological character of teaching required an examination of *how* we choose to teach the material that we do. In order to appreciate what computers have to offer literacy, we must go one step further, and explore the question of *why* we teach what we do.

For many education researchers – and particularly for those of us working within the social sciences and humanities at universities – the cornerstone of Western education has been, and must continue to be, the development and cultivation of literacy. As Richard Lanham summarizes:

> We read books and write about them and teach students about them. Yes, Homer may oxymoronically be 'oral literature,' and Chaucer may have recited his poems and Shakespeare written plays, but we deal with the book forms. It is the codex book which carries that vital symbolic charge, symbolizes our escape into our 'real' world, constitutes our badge of office, furnishes our genuine home. What is valuable about what we do is what happens when we read books. (1993: 8)

Given this particular framing of what matters in public education, there is already evidence that computer technologies threaten to irrevocably transform Canadian schools. Many schools (both K-12 and post-secondary) are now using computers to replace a number of printed resources in their libraries, allowing schools to provide research materials to students in an efficient, timely manner. Electronically submitted assignments further distance public education's daily routines from the physicality of paper and books, while Internet search engines

have largely eliminated the need to keep dictionaries and encyclopedias in classrooms. The study of specific literary works has largely been replaced with the study of the conditions that produce and affect literary works, a subject area that Liu refers to as "an apparent clone of information – cultural context" (2004: 1). The Internet's swirling miasma of information, argue educational technology's critics, overwhelms and obliterates the role of literacy in Canadian education. Preserving the codex book, we are warned, is essential to the preservation of both schools and Western culture.

That both schools and Western culture greatly predate the printed book is, however, more than a minor historical footnote. In the effort to frame computer technologies as a significant threat to established educational practices, many critics have completely overlooked the social and technological developments that have produced our current educational model. The codex book's pedagogical reign has benefited many aspects of Western civilization, but it is neither inevitable nor irreplaceable. As Lanham argues, "We have come to regard print as so inevitable that we have ceased to notice its extraordinary stylization" (1993: 73). For centuries, teachers have worked within print's boundaries to teach history and philosophy, and to develop creative writing skills; print has been at the foundation of journalism and political science, not to mention revolutionary movements and social justice. Although they are often thought of as the core of Western thought, codex books have arguably been the containers within which we have recorded thought for retrieval. That computer technology might serve a similar cultural function demands serious consideration

within the educational technology debate, and within Western society at large. Is the study of literacy the study of books, or is it the study of thought, language, and culture? More importantly, can computer technologies enhance our current understanding of literacy, or do they represent a cultural step backward from the printed word currently contained in books?

While there are few simple answers to these questions, I believe Lanham's critique of electronic literacy offers a useful middle ground for further discussion. He argues that although the goals of literacy education can be met with codex books, we do a great disservice to education's potential when we fail to consider how educational technologies can enhance current practice. The resiliency of current educational practice, built largely upon the codex book's printed word, has helped shape Western civilization and its development. Introducing computer technologies to this pedagogical framework provides teachers with an additional set of tools; while older tools may get less attention in the years to come, this does not mean that the functions they once served will be ignored. Indeed, literacy development may flourish with computer technologies, in ways that could not have been imagined with the printed word. Lanham provides the example of the criticism/creation dichotomy, which in a digital world, he argues, becomes "a dynamic oscillation: you simply cannot be a critic without being in turn a creator" (1993: 107). What is critical in this reconceptualization of public education is the understanding that a specific technology's usefulness will ultimately depend on how teachers integrate it into their classroom work. Electronic texts may be used to enhance the study of literature, as Lanham

suggests, but only if students are encouraged to use this particular characteristic of computer technology. This type of interaction cannot be programmed into software any more than it can be sewn into the binding of a book.

It is important that critics worry about how computers will alter the teaching of history, philosophy, and Western literature, but that should not prevent us from trying new approaches to teaching. Socrates warned that the printed word would destroy human memory: he may have had a point, but the fact that we still study his warning should give contemporary critics pause for thought. What is worth preserving in Canadian education need not disappear with the introduction of computers in classrooms. There is far more to the study of Canadian history and culture than can be contained in books or websites alone; teachers add the framing devices and pedagogical context required to transform information into knowledge.

While this defense of teaching practice is often invoked when attacking computer technologies, it is too often ignored when defending 'older' technologies. Ungerleider warns that while "students can find ample information about Canadian Confederation on the Internet," without suitable guidance "they are unlikely to be able to construct a coherent argument about the nature of the political compromise that Confederation represents and its recurring impact on Canadian civic life" (2003: 119). Ungerleider's concerns about the pedagogical value of the Internet are entirely valid. The exact same argument should, however, be made with regards to the printed word; without the guidance of an effective teacher, students learning about Confederation from textbooks will be

just as unlikely to construct the 'coherent argument' Ungerleider correctly identifies as public education's pedagogical goal. Paul Axelrod argues that internet technologies, just like conventional sources of academic research, are "nothing more or less than a massive source of information that must be sifted, scrutinized, and processed" (2002: 138). Accordingly, it is important to recognize the significant pedagogical role that computer technologies can play in public education, rather than rejecting them wholesale in favour of more traditional tools. As Lanham argues, "Western culture, for which 'the Great Books' has come to be a convenient shorthand phrase, is not threatened by the world of electronic text, but immensely strengthened and invigorated" (1993: 132).

The argument that 'Great Books' are threatened by computer technologies (or, as Allan Bloom [1987] believes, by the general cultural decline to be found in education) dips deeply into the language of cultural elitism. The crisis of literacy in Western culture, as perceived by the most conservative of critics, stems from public education's drift away from Great Books. This argument is based on the idea that a particular canon of literature contains not only the sole pedagogical framework for a successful system of schools, but also the unique moral character that has defined Western society for the past few centuries. Protecting the privileged position of Great Books, in addition to guarding against technology's advance into the classroom, therefore seeks to legitimize a particular ideology of power and authority. As Saul argues, "the reaction to this crisis has been a growing chorus, calling for a return to basic education in order to stop the decline;" this call, however:

> Probably has more to do with attempting to quiet growing public fury over ballooning illiteracy than with a serious desire to understand the problem. If anything, it resembles another reactive and prepackaged formula. Another management fad. On top of which it echoes eerily the old calls for the working classes to work harder, bathe once a week and go to church on Sunday. (1992: 132)

This is not to say that a 'return to basics' necessarily entails the legitimation of a particular ideology of power; Saul emphasizes the need to better understand the crisis of literacy because he recognizes the dangers of over-emphasizing the hegemonic history of the Great Books. While the 'Dead White Males' curriculum is in need of significant reform, it is a serious mistake to confuse the Great Books with the 'great teachings' that they have helped enable in public schools.

As a microcosm for the broader debates over Canadian education and computer technologies, the issue of literacy education demonstrates the need to address the question of *why* we teach; without thoughtful consideration of what Canadian teachers are trying to accomplish, debates over specific teaching practices matter very little. In his critique of educational technology, Postman defines superstition as "ignorance presented under the cloak of authority" (1988: 94). Within education, he notes, "the most perilous of all these superstitions is the belief, expressed in a variety of ways, that the study of literature and other humanistic subjects will result in one's becoming a more decent, liberal, tolerant, and civilized human being" (1988: 95). Although Postman's critique is somewhat similar to Saul's, I believe an important distinction can be found by considering literacy (and the study of literature) through the lens of *why* rather than *how*. It is true, as Postman argues, that the study of literature itself does not make citizens more tolerant or more civilized. Studying literature can begin to teach young

people the significance of language and writing in Western civilization; what it does not explicitly teach, however, is the historical and moral value of engaged citizenship.

Literature makes no claim to produce better citizens, nor do the other components of Canadian public education. The study of literature is, however, an excellent body of knowledge *from which* students may draw moral, political, and personal lessons. For Saul, the fundamental role of public education (from pre-school to the university) should be cultivating these higher forms of questioning and learning. The individual subjects are of secondary importance. Critical moral lessons can be derived from the study of economics or of environmental science, but for many years educators have found the study of literature to be a useful starting point for young learners.

Postman's warning is certainly useful – educators fool themselves if they believe that some individual areas of study are somehow more or less 'valuable' than others in the development of young citizens – but we must be careful not to throw the fundamental goals of humanism away with the heavy-handed self-inflation of the humanities. Selecting appropriate educational technologies, although significant, must proceed from the selection of particular curricular goals, which are in turn informed by the underlying pedagogical values of Canadian society. *Why* are we teaching students, *How* will we teach them, and finally, *What* specific tools can help deliver these lessons most effectively?

CHAPTER 4:
STUDENTS, YOUTH CULTURE, AND 'COOL' TECHNOLOGY

> *We watch in stunned amazement at the naked effrontery of initiatives launched in the name of 'globalism,' 'flexible production,' 'free trade,' 're-engineering,' 'total quality,' 'interactivity,' 'distance learning,' 'wired education,' and 'the virtual classroom.' We've discussed these bizarre agendas with our students and, frankly, they are not much impressed. (Winner 1997: 186-187)*

Educational technologies do not exist in a vacuum: students enter the classroom with an enormous range of technological experience, as well as a broad set of attitudes toward specific technologies, fuelled in no small part by consumer culture. This chapter explores the complexity of studying how young people interact with computer technologies, and argues that education research must study the impact of media and culture in the classroom, particularly as it is concerned with notions of 'cool' within youth culture. Although the history of 'cool' in the twentieth century begins with subcultures and counterculture, the contemporary model of Western cool is fundamentally intertwined with the rhetoric of the Knowledge Economy. With the emergence of an individualized producer culture – fuelled by the digital technologies of the Internet – there is an increasing overlap of cool culture with traditional sectors of economic production. The machines and programs designed for corporate, military, and bureaucratic control have now become the instruments of cultural expression and innovation. As more and more young Canadians are encouraged to use these technologies

in an educational setting, the already blurry divisions between school and work, work and play, personal and private, are at risk of disappearing altogether. Understanding the fundamental appeal of computer technologies, both to youth specifically and to popular culture more generally, will help education researchers to better understand how computers are used in Canadian classrooms.

4.1 'Damned Kids and their Skateboards...' (Generalizations, Students and Media)

It is important to untangle a number of highly problematic beliefs that have tended to make their way into education research dealing with students. First and foremost is the idea that students, like teachers, are some kind of homogenous mass to be studied. The multiplicity of experiences and identities in Canadian classrooms simply cannot be contained in a single categorical grouping; although the term 'students' remains useful for referring to a general population within public education (as opposed to teachers or administrators), it should not be used to universalize experience or to whitewash difference. In this respect, research dealing with Canadian students must confront the same problem that needs to be addressed in curriculum design – how can one model apply equally to a diverse group of young learners?

Within both frameworks, there is a significant risk of alienating a minority of students from the mainstream, however it is defined. In the case of technology studies, argues O'Riley, "The concept of knowledge that is mobilized is instrumental in the extreme and is concerned with control, privileging analytical

and hierarchical thinking over holistic thinking while downplaying intuitive, emotional, aesthetic, and spiritual dimensions of human experience" (2003: 61) Overcoming this initial hurdle is absolutely central to the success of education research, because it forces researchers to consider a range of student experience and reaction that can rarely be anticipated. If no two students are exactly alike, then no two experiences between student and technology can be exactly alike either.

Another common generalization about youth and youth culture (which is essentially an extension of the Great Books argument examined in the previous chapter) posits that, left to their own devices, young people will use computer technologies for personal entertainment, rather than for classroom learning. Living within a media-saturated landscape, it is argued, students are wholly incapable of using computers for anything more than play. In *Amusing Ourselves to Death*, for example, Postman critiques modern media sources, which he sees as providing information of two sorts: good information (from newspapers and books) was once "tied to the problems and decisions readers had to address in order to manage their personal and community affairs," making good information "*purposive*" information (qtd. in Lanham 1993: 240 italics in original). Lanham summarizes Postman's attitude toward bad information as "the 'context-free' information that we use for game and play" (1993: 240). Whether computer technologies provide students with 'purposive' information or not depends entirely on how one defines 'purposive' in an educational context. A good teacher can find tremendous pedagogical value in the types of information Postman

characterizes as 'context-free,' just as a bad teacher can squander the usefulness of 'good' information. Equating particular degrees of educational worth to specific technologies effectively marries the worst elements of cultural elitism with those of deterministic thinking.

A similar concern with the lowbrow nature of the media content found online and on television can be found throughout the literacy debate, essentially implying that students who favour electronic media are functionally aliterate. "An aliterate," argues Dr. Bernice Cullinan, "is a person who knows how to read but who doesn't choose to read;" aliterates get their news from television, which lacks the depth of analysis found in newspapers, journals and books (qtd. in Healy 1990: 23). Students who interact with computer technologies are at risk, therefore, because they are learning about the world from Yahoo! and Wikipedia, rather than from the *New York Times* or *Harper's*. As with the Great Books debate, underlying these arguments and their "scorn for mere information lurks good, old-fashioned social snobbery;" as Lanham argues, "We need not worry about people being swamped by useless information. They will pick out what is germane to their needs. Their psychological marketplace will work as it always has" (1993: 242).

Concerns with computers' effects on literacy tend to magnify the importance of individual encounters with technology, ignoring the broader context that informs an individual's media diet. "Students' understandings of technology," writes O'Riley, "are informed largely by texts outside of school, including their family, their culture, their experiences, their jobs, television, videos, movies,

computer games, comic books, magazines, music, body language" and much more (2003: 98). Assessing an individual student's level of literacy (both in the traditional sense and in a more contemporary, cultural sense) requires a holistic examination of their entire media diet.

As diets go, it should be noted that Canadian students are – for the most part – gorging themselves. Although significant schisms exist in access to computer technologies (as noted in an earlier chapter), more and more young people do have computers in their homes; new, cutting edge machines remain prohibitively expensive for many families, but even the most basic models available on the market today are more than adequate for basic needs. Consequently, the vast majority of Canadian students are growing up around computers, both in the classroom and at home. As Lanham argues, "The students we teach are going to do most of their writing and much of their reading on an electronic screen. They are going to live – they live now – in a world of electronic text" (1993: 121). The ubiquity of computer technologies, however, has led to another critical generalization in much of the research dealing with young people and technology; surrounded as we are by electronic screens of various shapes and sizes, it can be easy to treat them all as one and the same. The fundamental differences between how young people interact with television and with the computer, however, are central to understanding how educational technologies can and will be used in classrooms. Whether or not the majority of young people consciously recognize them as such, computers are sophisticated

devices that encourage multi-directional communication, whereas television is primarily used to receive content that is mass-produced and mass-broadcast.

Accordingly, a great deal of the criticism directed at computer technology has focused on its relation to consumer culture. In contemporary Western societies, however, consumer culture is hardly the only game in town. As Liu argues, "it is producer culture that governs work life and home life alike in the name of a ubiquitous new regime of knowledge" (2004: 77). Given such a complex and contested media terrain, it is entirely inadequate to talk of Canadian students having a single, homogenous 'media diet.' What is more useful is an approach to education research that embraces the size and scope of the media landscape inhabited by Canadian youth. Although I will expand upon this theme in the concluding chapter of this thesis, where I will advance a number of possible research models for future work in Canadian education, for the moment it will suffice to explore the notion of 'cultural pedagogy', which focuses on sites of education and learning other than the school itself. As Joe Kincheloe and Shirley Steinberg write, these are sites "where power is organized and deployed, including libraries, TV, movies, newspapers, magazines, toys, advertisements, video games, books, sports, and so on." (1997: 3-4).

The study of cultural pedagogy does not seek to diminish the role played by public education in the development of young people, although it does question the central, monolithic position schools have occupied for the better part of a century. Critically engaging with the pedagogical nature of electronic media

outside of classroom use can provide researchers with original insight into how these same tools may be used inside the classroom.

4.2 The Times, They Are A Changin' (Again)

When studying Canadian public education it is relatively easy to define the category, 'students,' to be examined: however heterogeneous a group they may be, the students are the ones sitting in small desks, and the teachers are the ones sitting behind big desks. Terms such as 'youth,' 'children,' and 'teenager,' however, are slightly more complicated. Can all students be considered youth, and are all children students? These questions are increasingly important in contemporary Canadian life, as social and cultural beliefs about childhood have greatly changed over the past few decades. "Childhood," Kincheloe and Steinberg write, "is a social and historical artifact, not simply a biological entity" (1997: 1). Although the majority of students in Canadian public schools fit into historical, biologically oriented categories of childhood (by virtue of being under eighteen years of age), it is impossible to determine what percentage – if any – of these students can be considered 'children' without a thorough investigation of what we mean by the term 'child.'

Older models of childhood have depended on boundaries and distinctions related to labour, knowledge, and sexuality, but, as Kincheloe and Steinberg observe, "The traditional childhood genie is out of the bottle and is unable to return;" as a result, they note, "Recent writing about childhood in both the popular and scholarly presses speaks of 'childhood lost,' 'children growing up too fast,'

and 'child terror in the isolation of the fragmented home and community' " (1997: 3). In the realm of education research, a great deal of anxiety and distrust surrounding computer technologies is inextricably linked to the various degrees of moral panic about childhood's recent transformations. An Information Society greatly enhances young people's ability to access media content that has previously been kept away from them for a variety of reasons. It should come as little surprise that children are also using the same computer technologies that are supposed to revolutionize the ways in which Canadian adults live, work and play.

The implications for public education are extraordinary; as more and more time spent outside the classroom can provide young Canadians with opportunities for learning, the role of the school itself must be re-evaluated. Rather than occupying the central, authoritative role as a dispenser of knowledge, schools must spend an increasing amount of time responding to external media sources. Ongoing efforts to introduce and expand 'media studies' in public school curricula are presented as absolutely essential to both the relevancy and usefulness of schools, while the rise in demand for Media Studies, Cultural Studies, and Communication courses at Canadian universities arguably reflects a growing desire among students to learn more about the media environment they inhabit. These types of change in Canadian schools have the potential to change both the content and structure of public education, just as earlier social developments (and their associated effects on the cultural construction of childhood) radically transformed public education.

The school's role as a central dispenser of knowledge, for example, was largely born in the Industrial Revolution's struggles over child labour; without a productive role to play in industrial sectors, young people were herded into newly created public schools in order to learn the skills and traits needed in the modern world. As a result, Willinsky argues, the creation of the school has more to do with ideologies of power than with high-minded Enlightenment principles of knowledge and freedom; public education was largely developed in response to declining child labour markets and the rising number of poor and immigrant families (2000a: 12). Similarly, Wotherspoon argues that the authoritative function of public schools developed as an adjunct to a much older institution of control, such as the church, in order to incorporate newly unemployed youth into well-established routines of indoctrination (2004: 171). As technological and political changes affected the nature of childhood, the system of public schools grew and adapted in a number of ways that continue to influence our thinking today. If childhood is indeed changing in an Information Society, it is in fact changing *again*.

The changes to childhood fueling current moral panics, however, might not be as earth shattering as critics imagine. Indeed, changes to public schooling brought on by the development of computer technologies are arguably far less significant to broader social understandings of childhood than those that came out of the Industrial Revolution. This is because, as I argued in a previous chapter, the characteristics of an Information Society model do not radically alter the fundamental economic and social conditions of everyday life. Canadian

students may be accessing greater and greater quantities of information on the Internet, but the essential role of Canadian public education is hardly at risk of being overthrown. At present, and for the foreseeable future, the majority of young Canadians continue to attend twelve years of schooling, after which they pursue post-secondary education or seek employment.

Despite the rhetoric of Knowledge Economy enthusiasts, the relationship between educational and economic sectors remains fairly constant: as management guru Peter Drucker admits, managers continue to look for "self-knowledge, wisdom and leadership ... all the knowledges and insights of the humanities and the social-sciences – psychology and philosophy, economics and history, the physical sciences and ethics" (qtd. in Oppenheimer 2003: 178). Regardless of whether or not children are 'growing up too fast' in modern Canadian society, they are still going to school to learn a variety of subjects; attempts to tailor school curricula to specific technical needs are, as I have already discussed, misguided at best.

Adapting pedagogical approaches along purely technological lines turns teaching into training, and while it is "perfectly legitimate for employers to want graduates who can read and write well, use numbers appropriately and intelligently, analyze a problem, and generate a creative approach to its solution," as Ungerleider and many others argue, "it is not reasonable to ask that graduates be trained to perform work unique to a particular workplace" (2003: 108). Changes to the social construction of childhood are undoubtedly occurring across Western cultures, owing in no small part to the extraordinary development

of computer technologies. These changes, however, do not in and of themselves justify massive educational reforms. As Aronowitz and Giroux argue:

> Rapidly changing technologies will require less, not more, training for the majority; it will require less task specific, specialized education and more 'generic' knowledge for the minority destined to occupy places in the technical, scientific and managerial hierarchy because much of the change is internally generated and radically reduces the time during which a particular technique remains operative. For this reason, specialized vocational training has less applicability to the work world then ever before. (1985: 189)

Public education must confront the changing nature of childhood in a media environment, but there is no need for public education to throw up its arms and surrender to the supposed inevitabilities of an Information Society. Indeed, what is particularly disarming for many education researchers is that the increase in media use among young people has attracted additional attention toward the field of public education; with so many concerned parents and advocacy groups focusing their efforts on youth and media, public schools are once again front and centre on the public agenda. The catch, however, is that neither moral crusaders nor technology enthusiasts are particularly interested in public education itself. Rather, they are concerned with what young people are doing online; the former worry that students are spending too much time accessing adult content, and the latter worry that students just aren't spending enough time online, where the future is unfolding.

Ultimately, discussions about young people and computer technology can only scratch the surface of a whole series of issues at play in public education. As Noble argues, despite the emphasis on 'higher order' skills offered by computers, "the major problems of the nation's school children and youth,

especially in urban schools, have less to do with 'higher order' intellectual abilities than with soaring dropout rates, mounting violence, an erosion of basic skills, a general disaffection, drug and alcohol abuse, pervasive childhood poverty, and widespread adult illiteracy" (1991: 170-171). The very same social dynamics that are transforming childhood are also making their mark on poverty, prejudice, addiction, mental health, parenting, etc. Computers can ameliorate or aggravate any number of these social issues, depending on the manner in which they are employed; giving laptops to the homeless makes about as much sense as giving preschoolers their own web domains, but that won't stop true-believers from trying either idea.

Academic researchers concerned with young people's education can help to direct future initiatives, provided that they situate educational technology within broader analyses of computers and children in Canadian society. And it is out of this larger context that we can begin to address one of the most significant features of computer technology and its relation to youth. Despite the Information Society's promises to enhance multi-directional communication, the dominant modes of computer interface are geared toward a single user: one student per desk, one student per computer; one worker per cubicle, one computer per worker. As Liu argues:

> It is from this coldness – remoteness, distantiation, impersonality – that *cool* emerges as the cultural dominant of our time. Strip away all the colorful metaphors of information seas, webs, highways, portals, windows, and the rest (like picture calendars tacked to the wall), and what comes to view is only the stark cubicle of the knowledge worker. Yet precisely in this cold space of nonidentity, cool appears as the *cultural* face – perhaps not the best or truest face, but the interface by which it knows itself – of knowledge work. (2004: 76)

Cool, as I will argue, is one of the most important aspects of contemporary media life, because it allows Information Society rhetoric to hijack traditional subcultural practices and reinvent them in the service of a Knowledge Economy. Cool touches virtually every major aspect of Western society, from the workplace to home life. Its implications for Canadian public education are enormous.

4.3 Rebel With a Blog: The Birth of the (New) Cool

Although it is patently 'uncool' to discuss that which makes cool things cool, I believe it is worth examining the contemporary mutation of cool that is alive and at play in the Western world. The genealogy of popular culture provides one interpretation of cool's history and development, but this heritage cannot be considered in isolation from the growth of computer technologies and the rhetoric of the Information Society. As Liu argues, our cultural notion of cool has evolved both as an adjunct to and critique of the Information Society, to the point where "cool is the shadow ethos of knowledge work. It is the 'unknowing,' or unproductive knowledge, within knowledge work by which those in the pipeline from the academy to the corporation 'gesture' toward an identity recompensing them for work in the age of identity management" (2004: 78). At the same time, however, cool has worked from within the realm of knowledge work to rewrite a number of cultural codes and values. Slick websites are cool. Subversive blogs are cool. iPods and camera-phones are cool. What makes websites, blogs and high-tech toys cool is that they are tools in the service of the Knowledge

Economy that can be used for personal expression. The machine is the same, the user is still working from an office, but the act of recording daily life's minutiae on a blog can be cool. Hours spent coding a personal website may be no less monotonous than the hours spent coding software at work, but at least the personal site is cool. Cool, argues Liu, is thus inextricably linked to notions of design, which he describes as "how we can be dominated by instrumental rationality and love it, too" (2004: 236).

There is, however, something about this notion of cool that seems unfamiliar, if not horribly unorthodox. What happened to punk rock bands, zoot suits, and the Fonz? How can it be cool to wear a tie, sit in a cubicle, and manage a database? As Liu asks, what makes knowledge workers "feel as secretly 'beat' or 'hip' as the countercultures of the 1950s and 1960s that borrowed subcultural cool precisely to drop out of the knowledge work for which they were destined (school, business, the 'military-industrial complex')?" (2004: 77) The simple answer is that knowledge workers and Hollywood producers have appropriated the bulk of subcultural cool's iconography. Teenaged rebels on motorbikes are simply aping Brando and Dean; any guitarist with spiked hair in the last twenty-five years is somehow indebted to the success of the Sex Pistols; even the malnourished, pimple-faced computer hacker in his mother's basement has become a clichéd archetype.

If knowledge workers are the cool pioneers of the modern age, it may have less to do with the coolness of their activities than with the relative dearth of options. "How can one still be cool," Liu asks, "when both the subcultural 'outside'

of older cool (now called 'niche markets') and the countercultural 'far out' of 1960s cool have been fenced in by networks that integrate differentiation with the corporation?" (2004: 139) Young people looking to express themselves creatively must confront the enormity of cool's genealogical record in Western society, which is broadcast on hundreds of television stations, in thousands of movies, and on millions of websites; faced with a culture that nostalgically fetishizes every incarnation of cool, it is hardly surprising that both definitions and expressions of cool have had to undergo significant transformation.

The coolness of computer technologies and knowledge work, however, are certainly not without historical precedent. Whether generated within mainstream popular culture, subversive counterculture, or external subculture, twentieth century cool is usually associated in some way with the technologies and practices of the rational, economic order. For example, the counterculture of the 1960s, as Liu writes:

> Was neither the 'insider' (mainstream) nor 'outsider' (subculture) of technological rationality. Instead, a whole generation of 'technocracy's children' who considered the wattage of a guitar amplifier to be their birthright used technological rationality to carve out a position for themselves as what might be called either 'insiders outside' (insiders who *elected* to drop out of work culture to imitate subculture's parody of technological rationality) or 'outsiders inside' (outsiders whose mode of protest was imbued so deeply with the techniques or technologies or work culture that parody all but disappeared). (2004: 136)

Counterculture's attempts to distance itself from the relationship between mainstream and subculture ultimately recycled the techniques and technologies of both groups. "To be 'on the road' required a car, even if only the 'people's' great anticar of the age, the Volkswagen Bug" (Liu 2004: 133). Similarly, the

major subcultural engines of cool in the twentieth century embodied a complex set of relationships between mainstream rationality and subcultural desire. In the process of defining alternative cultural practices, cool subcultures tended to perform "a complex enactment of technological rationality" that Liu refers to as "mock- or camouflage-technology;" this enactment, he argues, routinized and regulated the performance of cool, employing productive techniques and tools for entirely unproductive ends (2004: 101). In this way, the development of subcultural cool can be seen as a not-so-distant cousin of twentieth century economic practice; perfected use of accepted skills and technologies results in greater production levels.

Cool's relation to technology is highly relevant to discussions of contemporary knowledge work, because there is no easy way to discuss one without the other. The coding intricacies of web protocols may lack the glamour of the Fender Stratocaster guitar, but both are technological instruments used for the creative production and expression of cool; both require significant effort to master, and both require a particular, culturally acceptable style of 'play' in order to be considered cool. In this way, the hours and years spent mastering the techniques of cool are not unlike the technical skills of productive labour; as Liu writes, "There was only one cool way to grease one's hair, just as there was only one right way to oil a drill press. Style was the delinquency, but also the mimicry, of Taylorism" (2004: 102). In an era of knowledge work, media saturation, and children 'growing up too fast,' understanding the changes in cool takes on an additional urgency. As sophisticated computer technologies are expanding the

productive abilities of knowledge workers, one might argue that the production of cool culture is going to undergo the same processes of professionalization (greater flexibility, heightened autonomy, etc) and proletarianization (greater standardization, increased de-skilling, etc.) being felt in the teaching profession. Creating websites, blogs, and podcasts may represent a significant expansion of what can be considered cool in Western culture, but it also further constrains the realm of cool within technological boundaries.

If computers are both the preferred instruments of cool culture and the backbone of a global Knowledge Economy, the already tenuous distinction between productive and leisure time is at risk of disappearing altogether. Indeed, the distinction between productive and leisure time, like the distinction between public and private space, has effectively disappeared; the increasingly cool nature of computer technologies only makes it more difficult to conceptualize alternatives. The countercultures and subcultures of the past may have employed the same forms of technological rationality as the mainstream to which they reacted, but at least they tended to occupy a space that was clearly defined as external to dominant economic production. If the modern day descendant of this form of cultural expression is in fact found in the cubicles and offices of the corporate world, there is little hope that its content will fully escape the context from which it emerges; consequently, it is reasonable to expect that forms of cool culture will rely ever-increasingly on satire, parody and cool detachment in order to distinguish themselves from nearly identical content produced within the mainstream.

The increasing importance of computer technologies in defining what is cool therefore affects not only the content of cool culture, but also the engines of its production. As hip, reflexive websites attempt to disrupt the mainstream flow of information, the coolness of electronic technology becomes lost in an immense spectrum of barely differentiated ironic gestures, each more tongue-in-cheek than the last. If notions of cool remain so closely knit with the technologies of industry and commerce, there is bound to be an eventual return of a counterculture that attempts to situate itself outside of mainstream technological discourses.

4.4 Cool Machines, Cold Logic, and Glacial Metaphors

Although the increasingly cool nature of computer technologies is affecting public education in a number of ways, the most significant change might be taking place at a very conceptual level. Specific computer applications are undoubtedly designed in order to capitalize on the coolness of individual cultural elements, but the overarching coolness of computers is helping to drive technological development in a subtler manner. As I discussed in a previous chapter, the rhetoric of the Information Society enters into the cultural lexicon through particular metaphors that frame subsequent discussion: multitasking, rebooting, linking, etc. Metaphoric representations of the human mind have tended to rely on well-known archetypes, such as trees, books, machines, computers, networks, etc. This type of metaphorical mapping has been significant to education for centuries, shaping pedagogical practices as

necessary to keep pace with our understanding of how a student's mind develops. As Postman argues:

> There is no test, textbook, syllabus, or lesson plan that any of us creates that does not reflect our preference for some metaphor of the mind, or of knowledge, or of the process of learning. Do you believe a student's mind to be a muscle that must be exercised? Or a garden that must be cultivated? Or a dark cavern that must be illuminated? Or an empty vessel that must be filled to overflowing? Whichever you favor, your metaphor will control – often without your being aware of it – how you will proceed as a teacher. (1988: 29)

Over the past few decades, educational psychology has developed in tandem with the growth of electronic educational technologies. Establishing a chain of causality in these developments is truly a question of chickens and eggs: did technology designers build machines that corresponded to the latest psychological research, or did psychologists develop models that corresponded to the latest educational technologies? Regardless of which came first, it is important that educational researchers recognize the central importance of metaphor in what they do, as it can subtly shape the entirety of their work.

Over the past hundred years, there have been three dominant models to explain how young people learn, each with its own corresponding role for educational technologies to play. Richard Mayer refers to these models as Response Strengthening, Knowledge Acquisition, and Knowledge Construction (2003: 133). The Response Strengthening model positions the teacher as a "dispenser of rewards and punishments," making students the recipients of both; technology is used "to provide drill and practice on basic skills" only (Mayer 2003: 133). This model helps to legitimize the metaphor of the human mind being a muscle that needs exercise. Technologies such as flash cards can help students

repeat educational exercises over and over again, while ensuring that the final authority rests with the teacher. Similarly, the Knowledge Acquisition model sees the teacher as a "dispenser of information" who uses technologies to provide students (the recipients of information) with "access to information such as databases or hypermedia" (Mayer 2003: 133). The metaphor of the mind as an 'empty vessel' is privileged in this model, as students' brains should be filled with as much information as possible. Educational resources such as encyclopedias (print or electronic) are deemed essential to classroom practice, as are CD-ROMs and even Internet access. What remains important in this model is the role of the teacher as a gatekeeper of information; only the teacher can select appropriate materials to be dispensed to the students.

In the most recent model, however, the teacher is merely a "cognitive guide" for the student (or "sense maker"), and the role of technology is "to allow guided participation in academic tasks" (Mayer 2003: 133). The idea that students are guided toward educational outcomes, constructing meaning as they go, strengthens the metaphorical model of the human mind as a computer; appropriate inputs are processed and assembled according to established algorithms and processes, resulting in new patterns of knowledge that can be stored for further use. Thus, writes Mayer, the dominant theoretical model among contemporary researchers working in education is referred to as constructivism, or "the idea that learning occurs when learners actively try to make sense of material presented to them" (2003: 128).

Constructivism, however, no less than its predecessors associated with the other two dominant models of learning, is more than just a reflection of a particular, metaphorical understanding of the mind. As David E. Leary (1990) warns, metaphorical thinking "has helped to constitute, and not just reflect, scientific theory;" as a result, the development of educational technology may be guided by the metaphors of learning, "so that an instructional designer's view of how students learn drives the ways that technology is used to promote learning" (qtd. in Mayer 2003: 133). The metaphor of students 'constructing' knowledge from the world around them is certainly more appealing than older models of educational authority and control; nevertheless, 'construction' requires a set of tools and techniques that can be just as ideological and dominating as a teacher dispensing information and punishment. The appeal of constructivism, I believe, has more to do with the technologies that seem ideally suited to constructivist models of learning than with the actual ways in which students learn.

Multimedia presentations, computer simulations and internet portals, for example, can offer educators new ways to present complex materials, whereas traditional technologies (books, chalkboards, flash cards) must transform difficult concepts into two-dimensional, linear explanations. Framed by the metaphor that students construct meaning from the world around them, these sophisticated new computer technologies are an important step in the evolution of pedagogical practice. Nevertheless, it is not entirely clear that the fundamental nature of education (or of the human mind) has changed in the past few decades. If many new technologies are simply (and perhaps unintentionally) borrowing from the

metaphors of educational psychologists, it is entirely possible that we are re-conceptualizing educative processes in order to further legitimize the new tools available for classroom use. New, computer-enhanced learning, "in contrast to the information-processing view in which information is added to memory," allows learners to integrate prior knowledge with new information, such that information presented to both the eyes and ears is organized, analyzed, and integrated with prior knowledge into an "integrated cognitive structure" (Mayer 2003: 148). The appeal of this type of cognitive learning model is clear, as it recognizes the complexity of sensory input that education has always required. Traditional 'Great Books' advocates may argue that Western society has thrived for centuries on little more than the printed word, but the majority of educators recognize the importance of sounds and images in the learning process.

Students learn from the world around them, and they incorporate daily experience, music, art, poetry, film, television, and their own imagination into school life. Although contemporary models of human learning are undoubtedly accurate in assessing the importance of how knowledge is constructed, this is hardly an original idea. Education does not need to undergo revolutionary transformations just because a group of educational psychologists has suddenly discovered the wonders of multiple media. Words, and the meanings they contain, need not be presented aurally in order to supplement, complement or transform the meanings of images; what is important to the cognitive model is simply that various stimuli are selected and organized into coherent structures in the learner's mind. Accordingly, the 'low tech' (comic books, theatre, and music)

can often be just as effective as the 'high tech' (PowerPoint, the Internet, and television). A study of young British students found that listening to stories does more than simply introduce children to the ways in which language can be used. More importantly, observes Jane Healy, students learn to recognize "words alone as *the main source of meaning;*" children begin to appreciate that, even without accompanying illustrations, language can be highly symbolic (1990: 92 italics in original).

The sophisticated computer technologies of the Information Age may be culturally cool, but they are, to invoke Marshall McLuhan, surprisingly *hot* as educational tools. Computer technologies, marketed as both the instruments with which youth can express themselves creatively and as the cornerstone of a new global economy, may actually provide more information for young knowledge constructors than is useful for their development. Books may not be particularly cool nowadays, but at the very least they can help to stimulate high-order mental functions.

CHAPTER 5:
SOCIAL SCIENCE RESEARCH AND THE FUTURE OF CANADIAN EDUCATION

> *I cannot allow my understanding of the world to become elitist just because I have lost a democratic election; what I do need is to continue in my struggle for the improvement and democratization of the institutions within society. (Freire 1998: 60)*

University research can and must play a pivotal role in sustaining the highest quality system of public education in Canada. Although the various debates over computers in classrooms have grown to include the opinions of think-tanks, corporate leaders, military planners, government bureaucrats and media pundits, those of us engaged in social science and humanities research must believe that the inescapably public nature of our work continues to be the greatest source of its value. The ecology of knowledge within many Canadian universities, however, is not always suited for the kind of research that public education necessitates. Disciplinary boundaries and methodological misconceptions can severely limit the public usefulness of education research. What is needed in Canadian universities is an ecology of knowledge that reflects the scope and scale of education's vast enterprise; until there is room for a multitude of voices and research approaches in the mainstream of education research, the debates over educational technology will continue to ignore significant areas of concern.

The three major chapters in this thesis have attempted to explore the range of issues at play in debates over educational technology in Canadian schools; the purpose of this conclusion, then, is to advance a number of research models and methods that might inform future research in this area. While far from exhaustive, this final chapter seeks to present a comprehensive overview of the role that academic research can, and should play in Canadian society.

5.1 The Social Sciences in Canada: 'Barbarous Jargon' or Public Service?

Before my colleagues in the social sciences ready their tar and feathers, I will begin by asserting my belief that Canadian education researchers have generated an enormous quantity of relevant, informed work around educational technology over the past several decades. What is missing, however, is a concentrated effort aimed at disseminating this body of research to a larger audience. As Willinsky argues, the problem is not that "the social sciences fail to recommend or predict the single best program or policy in any given setting;" rather, the problem is "ensuring that coherent and comprehensible forms of knowledge – even in its diversity of methods and findings – are available for parents, educators, legislators, and the public at large, as well as for model builders and theorists analyzing the system as a whole" (2000b: 278). It is somewhat troubling that in a purported Information Society – where the democratic functionality of computers should be overwhelming each and every citizen with a glut of digital information – the bulk of social science research in

Canada remains unknown, and, in many cases, virtually unknowable. Those who generate and disseminate academic work may be harnessing computing technologies for a number of purposes (enhanced research capabilities, greater connectivity with distant colleagues, and long-term archiving solutions, for example), but they must not do so at the expense of research's public value. "What is most troubling about the current state of this political economy," writes Willinsky, "is how poorly the social sciences fulfill their political promise of public service" (2000b: 275). If the social sciences are to fulfill this promise, they must take a critical look at their current research practices to identify the obstacles to enhanced public service.

The first and most deeply entrenched obstacle to a healthier ecology of knowledge is the incredible fragmentation that exists within Canadian universities. Social science researchers concerned with education must work within a dense maze of disciplinary boundaries; these boundaries appear superficially as departmental jurisdictions, but can operate along much more subtle lines. It is perfectly understandable that academics, when given the opportunity, choose to work with people who share their political views, methodological approaches, and areas of interest. However, after years of study and specialization, few academics find themselves genuinely interested in and open to the practices, views and canonical works of other disciplines; "Such intellectual splintering," argues Saul, "explains some of academia's passivity before the crisis of the society they ought to be defending" (1995: 174). Thanks to an ever-expanding list of academic programs and departments, researchers

working toward common goals – the sustainability of high quality public education, for example – may rarely come into contact with their peers in their daily work. (Conferences and symposia may bring together researchers from a variety of locations and specializations, but they can just as easily reinforce existing divisions through panel structuring, scheduling, and participant selection.) Multidisciplinarity is becoming an increasingly core component of many funding processes in the social sciences and humanities, which could signal a broader shift in Canadian research practices. Nevertheless, although much successful collaboration continues to take place in Canadian universities each day, the overall effect of disciplinary boundaries remains a significant obstacle to truly multidisciplinary work.

Failure to work across disciplinary schisms, however, ultimately has a number of effects, each of which tends to reinforce the others. The effect on education itself, for example, is that disciplinary divisions perpetuate themselves as a form of academic safety valve. Lanham summarizes this condition superbly in a compelling metaphor, and is worth quoting at length:

> A modern university student is like a visiting anthropologist who changes countries as she changes classes, every fifty minutes. We departmentalized teachers are the 'natives' in this scenario, each of us speaking a professional language [...] We stay in our own country. We know it is the best country, indeed the inevitable country for anyone of intelligence and taste – else why would we have chosen to dwell there? We also know that in other departments-countries the inhabitants speak a barbarous jargon. But is that not natural? They are, after all, barbarians. What else would you expect them to speak? We ourselves speak the natural language of God, and it is our sacred obligation to teach that language to all students who pass our way. (Lanham 1993: 141-142)

The barriers to innovative, multidisciplinary research are extremely comforting to individual academics, because they bolster the belief that whatever they are currently doing is, in fact, the best possible way to do things. In the long run, however, this model may in fact be detrimental to the sustainability of the university. Thus the barriers – both physical and mental – that enclose the disciplines are dangers to all involved in Canadian universities, despite their short-term appeal to those working within them.

Just as troublesome, however, are the methodological divisions that often exist *within* individual disciplines. Researchers working in the same department, in the same general area of inquiry, may in fact approach the issue with wholly disparate beliefs regarding how research can, and even *must* be conducted. This division can be crudely conceived of in terms of 'qualitative vs. quantitative' work, or even 'theoretical vs. applied' research. That such differences persist in Canadian universities is particularly myopic, given the undeniable overlap of the warring factions; the 'academic apartheid' (or, to use an equally unfortunate metaphor, 'Balkanization') that some believe plagues the social sciences is, quite simply, preposterous. Methodological approaches to social science research may reflect the beliefs and preferences of an individual researcher, but they should never prevent researchers with different beliefs and preferences from engaging with each other in a thoughtful, collegial manner. The methodological divides within disciplines are, to use a less historically loaded metaphor, a red herring.

At the root of the disciplinary obstacles facing Canadian research is a cultural shift away from older, modernist notions of how knowledge must be

generated and guarded within universities. The desire to specialize must somehow accord itself with the promises of the Information Society, in which we should all have access to the bodies of knowledge traditionally housed in university departments; how can social science researchers establish credibility and authority in a specific academic field when the fields themselves continue to narrow, but the range of fields expands to keep pace with social and technological changes?

Finding solutions to this problem will require the social sciences to critically evaluate not only the practices that have been at the foundations of their research for decades, but also the very concepts of research and knowledge that have shaped these practices. Are there significant distinctions between historical approaches to public education and sociological approaches, and if there are, how have they developed and changed? At a deeper level, are there distinctions between contemporary attitudes toward researching public education and those of previous generations? How do researchers frame their work within the history of a discipline, and how does this framework work to change both the nature of individual research efforts and of the discipline as a whole? In order to remain culturally relevant in debates over public institutions such as education, the social sciences must consider their place in Canadian society, not as a set of disciplines but as a relatively cohesive network of academics. As Clifford Geertz (1983) writes, for university researchers, "the first step is surely to accept the depth of the differences; the second to understand what these differences are;

and the third to construct some sort of vocabulary in which they can be publicly formulated" (qtd. in Lanham 1993: 140).

Geertz's crucial third step is the most poorly articulated within Canadian universities. The argument that social scientists are public intellectuals has not yet permeated throughout the disciplines, nor has it taken on a marked sense of urgency in response to Information Society rhetoric. Rather, much of the Canadian university research community has turned further inward, believing that what makes their work valuable is its rarefied nature, free from the contamination of mainstream reception. As Willinsky argues, "Despite grant-winning prose from social scientists to the contrary, the profession appears to rely on trickle-down infomatics to carry some part of its work down from the great scholarly journals into the public domain" (2000b: 280). Trickle-down infomatics, however, can never replace rigorous academic research that is accessible to a range of Canadian audiences. Limiting the use of unnecessary, discipline-specific terminology (Lanham's 'barbarous jargons') will not lead to the death of academic work – indeed, it will increase the public usefulness and sustainability of the social sciences.

It should be noted that calls for the social sciences to better serve their public duty need not be accompanied by ideological calls for accountability, transparency, and utility in Canadian universities. Suggesting that the Canadian social sciences could better serve their public usefulness may sound similar to the suggestions made by right-wing think-tanks that universities should be

privatized in order to better serve the needs of the corporate world. But, as Willinsky argues:

> These interests in improving public access to social science research are all about strengthening the state of public knowledge and defending the play of ideas and information within the public sector. This project is about ensuring that the university plays a vital role in the democratic processes, enabling people to marshal and test arguments, to challenge and question programs and policies, to contribute to a public process of experimentation and investigation. (2000b: 286)

The usefulness of the social sciences in Canadian society is, therefore, ultimately related to notions of social *values*, rather than to any quantifiable measure of *value* per se. What are the areas of interest to Canadian social scientists, and what do their particular approaches and methodologies say about their interest in the area? Just as importantly, how is their work a reflection on, or a critique of, Canadian society at large? Education research does not deal with theoretical models of public education – it deals with actual schools, teachers and students; this connection to the everyday is the driving moral force that continues to ask social scientists to make their work relevant, accessible, and relatively progressive. As Willinsky argues, recognition that "Human values are the source and subject of the social sciences' research project" allows social science research to be "judged by how it adds to the richness and clarity of our thinking about these values and their consequences" (2000a: 218). Developing research practices that contribute to how Canadians think about public education must include careful consideration of values, goals, and customs.

5.2 Methodology and Practice: The Social Sciences, Somewhere Over the Rainbow

How, then, can Canadian education researchers develop research frameworks that take into account all of the problems, contradictions, and conundrums that arise at the intersection of technology and education? As O'Riley asks, "Is it possible to engage in research that is ethical, respectful, reciprocal, commensal, communal, joyful, rather than alienating?" (2003: 41) I have returned several times to O'Riley's attempts to grapple with methodological considerations throughout my own research, as her work is rich with the questions of *why* and *how* that I see as central to the future of education technology research: How can educational technology debates include a greater range of voices and concerns? How can research work independent of the economic ideology that drives the rhetoric of the Knowledge Economy? Situating educational technology within a complex network of discourses that freely crosses and overlaps disciplinary boundaries introduces new avenues for methodological consideration, further complicating an already dense field of inquiry. Failure to do so, however, greatly limits the public value of education research, as it ignores significant perspectives and voices in the educational technology debate. As Willinsky argues, "Fragmentation among ideas, studies, and practices will be reduced not by finding the unity of the knowledge but by people connecting ways of understanding and interpreting phenomena" (2000a: 235). Rather than seeking comprehensive, universal methodological approaches to education research, perhaps it would be useful to consider how various 'ways

of understanding and interpreting phenomena' can co-exist within a single community of Canadian social scientists.

The first step in such a consideration must be the recognition of cultural and ideological biases that characterize much of the education research conducted in Canada. As O'Riley observes, far too many researchers seek to incorporate difference into the mainstream of acceptable academic discourse; quite simply, "It is the rainbow going backwards into the prism, emerging as white light – unrefracted, undiffracted" (2003: 42). As I have argued in previous chapters, public education is an enormously complex field of inquiry, owing to cultural, geographical, and personal heterogeneity within both student and teacher populations. Studying the interactions between these populations and computer technologies must take into account the range of differences between researchers and their subjects. Furthermore, social scientists can no longer afford to see their work as ideologically neutral, or apolitical; researchers working in the field of education are fundamentally involved in defining the future of Canadian society. "Theories and methodological frameworks of traditional western science," argues O'Riley, "are guided by the conventional notions of value-neutrality, impartiality, and rationality, which are supposed to produce unbiased, dispassionate, disembodied objectivity. Bingo. Welcome to Oz / Kansas / the Supreme Court / prison" (2003: 42). Rather than pretend that their work is unbiased and objective, social science researchers should embrace wholeheartedly the social, political, progressive nature of their work. As long as there is sufficient recognition of what is at stake in public education, there is no

reason not to work towards ideological, even utopian, models of Canadian society.

Various methodological approaches can contribute to this sort of progressive education research, regardless of the specific academic discipline within which it is conducted. Methodologies that work across (or even against) disciplinary boundaries, however, are particularly relevant to education research, because they encourage researchers to look beyond canonical texts and personal comfort levels. For example, "*Anarchism*," writes Paul Feyerabend, "while perhaps not the most attractive *political* philosophy, is certainly excellent medicine for *epistemology*" (1975: 17 italics in original). Although the notion of anarchic methodologies is undoubtedly unsettling to many in the social sciences, it is essential that researchers embrace research paradigms of this sort; anarchism, even in small doses, serves as an antidote to conservatism, stagnation, and all other forms of stubborn academic enclosure. The resiliency of public school teachers, as I argued in a previous chapter, owes to the preservation of pedagogical values and ideals, rather than the mere continuation of specific practices and policies. Although the underlying values and ideals of the social sciences are certainly worth protecting, the everyday research practices in the social sciences that have developed over time are reflections, and not the embodiment, of these underlying ideas.

What makes social science research meaningful is not the methodological instrument employed in any given study. Rather, it is the purpose of the research undertaken that makes the social sciences important to Canadian society. This

purpose, as Postman argues, "is to rediscover the truths of social life; to comment on and criticize the moral behavior of people; and finally, to put forward metaphors, images, and ideas that can help people live with some measure of understanding and dignity" (1988: 18). Accordingly, social science research should stop seeing itself as an enlightened attempt to discover and enumerate the definitive methods of teaching and learning.

All education researchers in the social sciences are engaged in a collective effort to improve the quality and breadth of democratic practices, symbolized most concretely and universally in public education. How we teach young people is a vital concern to all Canadians, but we are dangerously deluded to think that policies and practices in education are 'right' or 'wrong'. Education researchers are, as Postman notes, simply storytellers; each storyteller provides "a unique interpretation to a set of human events," which "cannot be proved or disproved but draws its appeal from the power of its language, the depth of its explanations, the relevance of its examples, and the credibility of its theme" (1988: 13). Some stories seem to fit the mood and desire of Canadian society, and others do not. Social science scholars and professionals may uncover successful practices through observation, research and theory, but their findings do not become established, unquestioned fact. For this reason, it can be exceptionally useful for social science researchers to embrace methodologies from the arts and humanities, and not just from the natural and physical sciences. Education researchers, even those who conduct empirical work, are really just

storytellers, trying to convince the Canadian public of the importance, relevance, and urgency of their narrative.

5.3 Computers in Classrooms: What's Next?

Educational technology represents a critical test for the social sciences in Canada because it brings together the human and the technical in an extraordinarily complex manner; neither strand can be untangled from the other, thereby necessitating research approaches that straddle disciplines and embrace discourses of difference. Just as importantly, educational technology demands that we consider the fundamental reasons that we conduct research in the first place. Utopian ideals and critical social realities cannot be avoided, nor can the changes occurring within Canadian society at large in the age of computer technologies. The social sciences must take a leading role in the public debate over educational technology, in order to bring some degree of balanced reflection to the discussion. As Freire writes:

> It is as urgent as it is necessary that technology be understood correctly – not as diabolical works always threatening human beings, but as having a profile of constant service to their well-being. This critical understanding of technology, with which the education we need must be infused, is one that sees in it a growing capacity for intervention in the world, one that must necessarily be subjected to the political and ethical test. The greater the importance of technology becomes today, the more pronounced becomes the need for rigorous ethical vigilance over it. (Freire 2004: 85)

This vigilance suggests that it is imperative that education researchers consider how computers can best be used in the global struggles for social justice. Rejecting the possibility of deploying these new sophisticated tools for humanistic

purposes greatly undermines our collective ability to affect global change. The social sciences must find ways to effectively bring together the values that define Canadian society with the communicative powers of computer technologies. Willinsky argues that, "Neither the accrued knowledge of the social sciences nor the new technologies of the Internet will deliver us once and for all from the social dilemmas we now face, nor will they return us to what we imagine we have lost by ways of community and environment" (2000a: 238). Nonetheless, the social sciences must challenge themselves to do as much as they can to improve the future of life in Canada.

Computer technologies and their uses in public education are therefore more than just a test for the social sciences; rather, the manner in which we approach the educational technology debate will invariably help to shape the future trajectories of not only public education and computer development, but of Canadian society at large. It is imperative that all Canadians learn to clearly differentiate the stated aims of educational technology designers from the practical 'real world' implications of their efforts. Individual technologies have neither the ability to help meet educational goals nor to hinder them. While individual learning technologies invariably reflect the purposes and politics of their design processes, the abstract notion of 'technology' can generally be painted as value-neutral.

Understood as a collection of transistors and chips, a computer has the potential to transform educational practices in any number of ways. In practice, however, educational technologies tend to contradict many of public education's

stated ideals and values. A single keyboard and mouse, for example, allow only one student to directly interface with programming and audio-visual content that could easily address an entire class; instead of seeing computers as inherently isolating learning tools, we need to recognize the human choices behind the single keyboard, single mouse setup. Such a setup is often useful in corporate or industrial training, but it isn't well suited for the goals of public schooling. Comparing computer technologies with older technological breakthroughs, Saul argues that, "when the printing press was introduced, the result was not an economic revolution, but a humanist revolution, driven by language, beliefs and a desire to understand – the world was profoundly changed" (1995: 140). The current wave of technological innovation has yet to have a similar impact on the social fabric of Western societies; whether or not computers and computer technologies strengthen progressive movements remains to be seen, and will depend entirely on the choices of individuals and groups. We should be particularly wary of individuals and groups who hide their own beliefs behind the tools and technologies they peddle, as if the machines themselves can embody progress, change, growth, or justice.

The ongoing educational technology debates demand that Canadians be critical, open-minded and forward thinking. It is imperative that our discussions of computers in classrooms focus on pedagogical and cultural goals, and not solely on the latest technological marvel. Despite common rhetoric about the Information Society and the Knowledge Economy, there are no inherent inevitabilities built into computers; determinisms of all kinds must be questioned

at every opportunity, so that we never forget that we are the toolmakers, and not the tools. Controlling educational technologies is essential to the ongoing sustainability of Canadian public education, because it encourages us to think about how and why we teach. The fundamental purposes of public education are at the heart of an open, democratic society. Whether or not computers can play a meaningful role in working toward these purposes is entirely dependent on teachers, students, social scientists, and Canadian citizens as a whole; the tools themselves cannot be praised or condemned for their effects on education. The study of educational technologies can contribute to the success of all schools, but only if it is conducted in the service of public education, rather than computer technologies. If we wish to build and sustain the best possible system of public education in Canada, it is imperative that we investigate our own practices as researchers, our own cultural assumptions as user of computer technologies, and our own values as Canadian citizens. In short, we must never stop learning.

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