Who Has The Key?
Accessing The Technology Citadel

by

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ABSTRACT

Perceptions of new technologies originate from well-established community practices and provide arenas for political and social manipulation. In British Columbia (1995-1996) all school districts were required to submit technology plans in order to qualify for targeted funding. These plans publicly embody the social and political organization of gendered technologies and bring into view the social relations and practices in which the texts are embedded. My rationale for constructing this document is to assess the deployment of technology in the education planning of the school districts in British Columbia as evidenced in the narratives of their texts thus making visible the gendered power relations that define the prevailing knowledge and practices of technology.

A quantitative analysis of courses related to the areas of science and technology was undertaken wherein class composition was analyzed by sex for both students and instructors. Female students and instructors were not represented in numbers consistent with their representation in the system as a whole. Omission of women in representative numbers in the technology planning process was also found. This brings into direct view the social relations/organization and "biased" practices of the education system. Official government texts preceding the initiative were summarized and District Technology Plans were also analyzed to interpret the social relations and social practices embedded in the texts. Specifically, these texts were examined to determine their understandings and representations in four areas: equity, curriculum, staff development and technology.
Generally plans were presented in a manner that suggested factual status with scant engagement with ideas outside of Ministry requirements. Cost-effective and efficient delivery of services, programs and resources were depicted as commensurate with the introduction of new technologies and as justification for their introduction. The requisiteness of technology was a common theme in all documents. The detailing of the material tangibles (hardware inventories, cabling, etc.) was virtually universal whereas the detailing of the human enterprise (teacher development, equity issues, and implementation) was relatively deficient in comparison. The connection between technology and the social issues associated with gender equity was not at all developed with the exception of three school districts.
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This thesis is dedicated to the many women, young and old, past and present, whose contributions are and have been unrecognized in the areas of science and technology. I especially wish to acknowledge the “anonymous” young female students whose project was not deemed “valuable” enough to be demonstrated at the first Technology Planning Institute held in October of 1995 at Silver Star Mountain. It is my hope that the education environment may soon progress so that their daughters may know a truly equitable manner of treatment.

I wish to thank Mary Bryson, who served as my mentor and advisor on this thesis. Her support for my work was indomitable. I also would like to thank Gaalen Erickson, whose insightful comments always came when they were needed most. The gifts of friendship and time from these two exceptional individuals have brought this thesis to its conclusion.

My family and friends have also extended their encouragement and support during the “lengthy” process of writing this thesis. I wish to thank them for their patience.
CHAPTER I: A KEY OF ONE'S OWN

Critics argue that conventional social research dulls the imagination; locks the observed inside rigid category systems having little to do with the culture of the researched, but everything to do with our research culture; promotes insidious institutionalization of social boundaries that separate “us” (the observers) from “them” (the observed)... Meaningful change... the only proper postmodern response is to break from received traditions and institutionally situated realities. The text of the future not only will look different but also it will be constructed on different grounds than those of the past. (Rose, 1990, Editor's Introduction, p.5)

This thesis will not be tidy (Steedman, 1982). My research attempts to move beyond “rigid category systems” and “break from received traditions and institutionally situated realities”. My topic is complex, interdisciplinary and contentious, incorporating gender equity, technology planning, educational change, and policy development. The complexities of the individual topics, in and of themselves, are such that an attempt to weave them into a cohesive explanation guarantees awkwardness. Because “the text of the future... will look different ... [and] be constructed on different grounds than those of the past” (Rose, 1990, p.5) and, accordingly I am attempting here the construction of a untidy text. This thesis is primarily concerned with the textual constructions of policy documents pertaining to the implementation of new technologies in British Columbian schools. As I work within the education environs, bombarded with the rhetoric of change, I see beleaguered teachers. They are the targeted victims of an avalanche of social and political initiatives which are perpetually proposed to change the culture and practices of education. They are either legislated, indoctrinated, or ‘persuaded’ to change their practices, often without meaningful consultation and support for implementation. The conservative culture of teaching is such that the
dissident voices are often silenced and 'profitable' discussion discouraged. I believe that if we are ever to move beyond banal declarations and remedies for educational change, there ought to be a place where knowledge and reason converge with the social and political demands.

I begin with a personal anecdote intended to serve as a starting place for exploring the technology plans of British Columbian school districts. If I had not been denied a key to the “technology cupboard”, I would not have read Woolf’s *A Room of One’s Own* with such ardor. Nor, might I have selected gender equity and technology as my themes for exploration. I was and continue to be compelled to find answers for why I was considered “a security risk”; why “four” keys are secure and a “fifth” insecure; and why it is not considered a gender issue when four men have keys and not one woman has.

“At any rate, when a subject is highly controversial- and any question about sex is that - one cannot hope to tell the truth. One can only show how one came to hold whatever opinion one does hold. One can only give one’s audience the chance of drawing their own conclusions as they observe the limitations, the prejudices, the idiosyncrasies of the speaker. Fiction here is likely to contain more truth than fact.” (Woolf, 1929, p.8)

As I write about women and technology in education, I do not believe that money and increasing the number of computers will offset current policies and practices which obstruct women from accessing and becoming proficient users of technology. Woolf, when asked to speak about women and fiction, offered the opinion that if a woman were to write fiction she must have money and a room of her own. I, as a woman, find that I need a ‘key’ of my own. Using Virginia Woolf’s, *A Room of One’s Own*, as my muse, I will endeavor to clarify how I arrive at my opinions, probe for critical questions and distinguish my stance in terms of theory, role, context, and methodology.

As a lone woman on a district planning team and a teacher educator in
the area of information technology, my interest in the relationships between gender and technology increased when I declared my intent to become technologically "literate" and accepted in a "community of practice"\textsuperscript{1} where few women reside. In the course of my work I have participated in numerous interdistrict technology meetings and conferences, where I came to view the relationship between gender and technology as anything but neutral. Brown, Collins and Duguid (1989) argue that the activities "in which knowledge is developed and deployed...is not separable from or ancillary to learning and cognition. Nor is it neutral" (p. 32).

My stories are personal and the arena in which I work public, individuals become identifiable, and for these reasons, I find myself ethically silenced by my location. I cannot specify the details of the stories which have led to my choosing this venue to make sense of my experience. I often choose the words of others to identify the themes I uncover as I seek to understand my experiences. Dan Rose offers me this license when he...

"suggests that our traditions are such that pretextual assumptions passed from one generation to the next more or less determine what it is we experience in the worlds we investigate, and, therefore what we can say about these worlds. In terms of the future, our link to the past must be broken experientially by reversing our methodological practices. Such reversals would foster ethnographies of intimacy, not distance; of stories, not models; of possibilities, not stabilities; of contingent understandings, not detachable conclusions. (Rose, 1990, p.6)

\textsuperscript{1} The term "community of practice" is defined by Lave and Wenger (1991, pp.98-100) as follows: A community of practice is a set of relations among persons, activity, and world, over time and in relation with other tangential nd overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not the least because it provides the interpretive support necessary for making sense of its heritage. Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. The social structure of this practice, its power relations, and its conditions for legitimacy define possibilities for learning...
Building A Rationale

The work of Lave & Wenger (1991) and Brown, Collins & Duguid (1989) engaged my curiosity and seemed to provide a means to explore the social relations and understandings around technology use in my own 'community of practice'. To the extent that understanding is a byproduct of engagement and participation in the use of technology, I am concerned that women, especially women teachers and female students will find barriers, some invisible, denying them access to and participation with technology.

"Participation...is especially significant because the artifacts used within a cultural practice carry a substantial portion of the practice's heritage....thus understanding the technology of practice is more than learning to use its tools; it is a way to connect with the history of the practice and to participate more directly in its cultural life."(Lave & Wenger, 1991, p. 101)

Although the use of technological tools eventually becomes transparent to users (Franklin, 1990), the introduction of new information technologies is a significant place to interrupt long standing inequities. Perceptions of new technologies originate from well-established community practices and provide arenas for political and social manipulation. Intervention at the time of the introduction of new technology has a chance of breaking established patterns which if left alone will recreate the inequities of the past. "In the 'Information Age', the struggle over the origin, interpretation, and distribution of information has become (a) vital source of power. Educational institutions... are sites of contestation, where conflicting interests struggle to shape the symbolic terrain of our culture" (Goodson, 1991, dust cover).

Lave and Wenger argue that the introduction of new information technologies mediate the forms of participation in the cultural practices of the social organization into which it is introduced. Productive activity and understanding are inseparable and dialectically related. As a result, the
artifacts of technology and the understanding of their significance become part and parcel of the learning process (Lave & Wenger, 1991). Conflict and synergy are central to all aspects of learning in practice. It is the visibility and the far-reaching cultural and economical significance of the technology which is invoked in promoting its use. Furthermore, the visibility and historical revelance of technology also enable us to predict the plausible consequences of gendered inequities. In fact, it is this very visibility and significance which will perhaps allow us to circumvent the gender inequities and provide us with a strategic opportunity to implement, to teach, to promote and to use information technologies in an equitable fashion.

**Purpose of Study**

In British Columbia (1995-1996) all school districts are required to submit technology plans in order to qualify for targeted funding of technology. Planning for the organization of access and use of new technologies will shape the legitimate participation of women and girls as users of this new technology. In this thesis I examine the policies and interpretations of "equitable distribution of education technologies within the District" (Ministry of Education Correspondence, June 1995) in the technology plans in order to analyze the constitutive concepts of "equity" and "technology".

It is the goal of this thesis to analyze by means of a textual excavation, the provision for equity and the scope of staff development within the plans to determine the place of knowledge (of new information technology) in these communities of practice and the ways (explicit and implicit) the resources for learning new information technology in practice are structured. Are there visible differences in accessibility to information technology and how are they managed? Is there a visible plan for how newcomers are invited to become active participants and claim membership in the community of practice? What does this transition from nonmembership to membership in this community of practice entail and does it incorporate the intent of gender equity as expressed in the Integrated Resource Packages? In fact, what is
understood as curriculum in the technology plans?

The Context and Role of Technology

A foundational argument here is that "technology" is a multifaceted entity transforming "the basic patterns of communication and knowledge interchange in societies, and automating the component process of thinking and problem solving. In changing situations of knowledge acquisition and use, the new interactive technologies redefine- in ways yet to be determined- what it means to know and understand, and what it means to become 'literate' or an 'educated citizen'" (R. Pea, J.S. Brown in Lave & Wenger 1991, p. 12). Cuban's (1985) book, Teachers and Machines, explores the enduring paradox of the teacher machine relationship. Film, radio, television and computers have all failed to revolutionize instruction within the classroom whereas their iconic success has been monumental in the recreational, scientific, industrial and commercial contexts of our lives. Why, the failure in the educational context? In what ways might the technological culture of our society be colliding with the school curriculum and the school culture? Are there historical roots of social control of technology? Is this history impacting on the classrooms in the present? Where do the people who write and approve the district technology plans situate the power, in the people who use the technology or in the technology itself?

Transformation or Reproduction

Situating my research in feminist pedagogy provides a framework from which to consider my practice as a teacher, consultant and staff developer. Within a context of practical inquiry I intend to examine the textual representations of power, voice, and the nature of knowledge as evidenced in British Columbia's school districts' (1995-1996) technology plans. I have participated in writing a district technology plan so my involvement in this research is not impartial. It is this close relationship with technology and my feminist perspective that move me to examine the results of the technology
planning initiative instigated by the Ministry in the fall of 1995. It is my contention that schools and districts are examples of institutions and bureaucracies whose praxis reveal their official and practiced (hidden) curricula. The District Technology Plans are the texts which publicly embody the social and political organization of gendered technologies. The plans bring into view the social relations and practices in which the texts are embedded. How is knowledge about technology produced and reproduced in this community of practice? What impact might residence in this community of practice have on one’s outlook toward new information technologies? Whose interests are served by the skills fostered by the technologies in the community of practice? Do these interests move in the direction of emancipation, equity, and social justice?²

Dorothy Smith (1990 a,b) cautions against the isolation of the texts from the embedded and organizing practices of the institutions/places they organize. For this reason, the literature review will include a brief summary of the already gendered context of education.

Texts are situated in and structure social relations (extended social courses of action) in which people are actively at work. Texts enter into and order courses of action and relations among individuals. The texts themselves have a material presence and are produced in an economic and social process which is part of a political economy...Textually mediated discourse is a distinctive feature of contemporary society existing as socially organized communicative and interpretative practices intersecting with and structuring people’s everyday worlds and contributing thereby to the organization of the social relations ...

Social forms of consciousness, ‘femininity’ included, can be examined as actual practices, actual activities, taking place in real time, in real places, using definite material means and under definite material conditions. Texts, however, must not

² These questions have been intentionally paraphrased from Schubert’s (1986, pp. 326-330) Curriculum: Perspective, Paradigm and Possibility to relate to technology because technology is not a neutral tool. Its implementation attaches a “hidden” curriculum.
be isolated from the practices in which they are embedded and which they organize. The reading or viewing of texts, how people organize their activities in relation to texts, and the skills and practices involved ... are essential to the investigating of textually mediated discourse. (Smith, 1990, pp. 162-163)

Relevancy, Current Provincial Emphasis

In this “Information Age” there can be no doubt that the deployment of new technology in instructional environments is significant. The Province of British Columbia in its The Kindergarten to Grade 12 Educational Plan (1994) has introduced numerous educational initiatives during the past few years, including a focus on technology as follows: “The Ministry of Education has identified the need to fund and coordinate the distribution of technology in public schools, and to emphasize the importance of technology-based learning for students and teachers.” (see British Columbia Ministry of Education, 1995a, p. 2) The Ministry of Education’s Technology in British Columbia Public Schools (1995) details a vision of students with “equal access” to “information technology tools and skills that lead to future career and learning success” and of teachers “supported with training, to help them integrate technology into daily learning activities”. (p. 2) “Technology will be used not only to teach computer and media literacy, but as instructional support in all areas of the curriculum. Rather than a specialized lab-type experience, the computer and other information technology must become a general tool that students use to acquire knowledge and solve problems in all subject areas.” (p. 2) The important place of technology in change initiatives for British Columbia schools is not in doubt. The question is whether there will be equal access to this technology by women teachers and female students.
I found myself walking with extreme rapidity across a grass plot. Instantly a man's figure rose to intercept me. Nor did I at first understand that the gesticulations...were aimed at me. His face expressed horror and indignation. Instinct rather than reason came to my help... I was a woman. This was the turf; there was the path. Only the Fellows and Scholars are allowed here; the gravel is the place for me. Such thoughts were the work of the moment. As I regained the path...his face assumed its usual repose, and though turf is better walking than gravel, no very great harm was done. (Woolf, 1929, p.10)

I, too, find myself walking on a path where there are too few women to guide my steps. My pride, both a target and a detriment, serves as both friend and catalyst directing me to wake the sleeping prejudices that rest beneath the content and the context of technology in education. Others who have gone before me have seen and recorded what I, too, see and now report.

I think women care about things that relate to their lives personally. I think that the more involvement they have in something that affects them personally, the more they're going to be able to give and to get out of it... I think they break down an issue and pick out what it is about that has happened to them or they can relate to in some way, and that's how they start to explore it. (Belenky, Clinchy, Goldberger and Tarule, 1986, p.202)

My writing strategy here is to use this thesis to record not only the results of my research, but also to capture my many facile attempts to work with new concepts and methodology. As I critique and analyze the policies and texts found in school district technology plans, I am reminded that for many of those authors this, too, was their first attempt in writing a text that would be publicly vetted. In what ways might their experience and training...
have prepared them for the challenge? This is a question I will not be answering. Nevertheless, the point of the question is to establish that the authors and contributors of the technology plans were and are relative novices in the area of technology planning and my work is not to find fault with their efforts but to emphasize recommendations for the next time.

...it occurred to me that by asking them to choose a topic as the first step in writing their research proposal, I was implying, indeed insisting, that research is necessarily a linear, rational process initiated by the identification of a researchable question. In doing so, I forgot that for some of us research questions emerged out of and reflected our lives and experience, but often slowly and gradually igniting our sociological imagination. I forgot that research questions often took months or years to take some identifiable shape. I forgot how some of us backed into projects, literally doing the research before we ever articulated a question. In some cases we inherited projects from mentors. in other cases, in doing our own research we abandoned one set of concerns only to pursue another. In other words, I conveniently forgot, in writing the assignment, about the variety of (nonlinear, nonrational) ways in which my colleagues and I had come to define a research question or agenda. (Ewick, 1994 as quoted in Kaufman, 1996, pp.171-172)

To reiterate, my rationale for constructing this document is to assess the deployment of technology in the education planning of the school districts in British Columbia as evidenced in the narratives of their texts. I am curious as to how “technology” is represented. The social, economic, and political ramifications of the introduction of new information technologies are anything but neutral. A key concern, then, is to determine not just the foci of educational policymakers but to consider whether, in actuality, their texts show evidence of any critical reflection at all.
CHAPTER 2: TECHNOLOGY AS A GENDERED SUBJECT

Women have been in darkness for centuries. They don’t know themselves. Or only poorly. And when women write, they translate the darkness. Men don’t translate. They begin from a theoretical platform that is already in place, already elaborated. The writing of women is really translated from the unknown, like a new way of communicating, rather than an already formed language. (Duras, 1975, as quoted in Belenky, Clinchy, Goldberger and Tarule, 1986, p.203)

Darkness

I am twenty years a teacher and the dawning of feminist thought, the translation of darkness, began by chance three years ago, when I audited a course by Dr. Mary Bryson who suggested that I read material by people like Ursula Franklin, Judy Wajcman, Sandra Harding and Dorothy Smith. After reading numerous feminist texts I still find the words women, girls and education difficult to string together in one sentence. Time, perseverance and one singular friend, have been my allies, as I shoulder the critical commentary I encounter, when I expose my views on “changing the educational landscape”. I now question the paucity of feminist educators and scholars on the bookshelves of my colleagues; why no female equivalent of Dewey or Hirst quoted to exact reason?

It is important to understand, therefore, that, although

2 The intention behind this comment is to emphasize the lack of references made to female scholars. When I am presented with bibliographies from university professors one of my immediate responses is to check to see if women have been included. More often than not, there is exclusion and the question then becomes one of whether or not it is (or is it not) an “oversight”.

11
throughout history women have reared and taught the young and have themselves been educated, they are excluded both as the subjects and objects of educational thought from the standard texts and anthologies: as subjects, their philosophical works on education are ignored; as objects, works by men about their education and also their role as educators of the young are largely neglected. Moreover the very definition of education and the educational realm adopted implicitly by the standard texts, and made explicit by contemporary analytic philosophers of education, excludes women. (Martin, 1993, p.36)

Containing the words science and technology, my job description eventually led me to (SCWIST) Society for Canadian Women in Science and Technology. It was here that I began to look for the scholarship that would support my venture into connecting women and girls to education and technology. I also wished to find a feminist methodology for professional development. A small, windowless basement room, that was minuitiae of office and library, offered some comfort but not the abundance of material for which I had hoped.

The most transient visitor to this planet... could not fail to be aware, even from this scattered testimony, that...is under the rule of a patriarchy. Nobody in their senses could fail to detect the dominance of the professor. His was the power and the money and the influence. (Woolf, 1929, p.39)

Fig. 2.1

As I searched for the academic legitimization of my passion, I encountered women’s names; Evelyn Fox Keller and Barbara McClintock, names, I had not seen before. I found intriguing titles like Noble’s A World Without Women and Shepherd’s Lifting the Veil. The first title provided an apt description of my experiences in technology and science facilitators’ meetings as well as suggesting a historical revelation; the second title
promised hope and resolution.

In my community of practice as a teacher consultant, women are not prominent in positions involving technology and science, let alone, power and influence. And so, this literature review represents my attempts to understand why this might be so. As subjects like science and technology appear to be gaining prominence in the curriculum, where are the women?

Science and technology continue to dominate change and to drive social and economic trends. Those students excluded from the study of science are thus effectively excluded from the domains which choose and direct change. This separation has obvious consequences for employment and the future work force, but it also has wider implications, including the ends to which science and technology will be directed and how public priorities will be determined. (Canadian Teachers’ Federation, 1988, p.3)

I was until recently, ignorant of women like Alphra Behn (1640-1689), a traveler, an early abolitionist, a spy in the King’s service, a playwright, a poet, a novelist and a feminist who argued for autonomy and full educational rights on behalf of women some three hundred years ago. Neither wealthy nor a woman of rank, she was successful and yet her achievements were demeaned. She was condemned for lack of a classical education; one which was denied her because of her gender. Through some extraordinary feat she was able to secure recognition as an “equal” from the literary establishment of Reformation England. Yet, she was never a part of the literature syllabus in my education. I strongly believe that

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3 My emphasis. For this thesis I am equating public priorities with the publicly distributed district technology plans. This material is dealt with in Chapter Three.
my ignorance is not of my own making. Like Alphra Behn, I know that education for women requires something much more consequential than "equal" access. I am the product of "equal" access and my education has not revealed this world where women scholars, scientists, historians, philosophers, and writers reside. Something has been, and I believe still is, amiss. My education has deprived me of the knowledge, the discoveries and the protests of the many women who have come before and after Alphra Behn. The lives, the understandings, the heritage of women like Alphra Behn do not and have not contributed to the disciplines or to the subject matter of the curricula I have experienced or taught. Neither are the lives, the understandings, and the heritage of women like Alphra Behn represented in the resources with which I teach. Why are the women in/visible?

We have been kept in ignorance about the protests that women have made so that every generation has to begin again from the beginning. The understandings that women have forged do not constitute a discipline or a subject, they are not systematically encoded and transmitted to the next generation; it is men who monopolize the influential positions from which it is decided what is to be taught. (Spender, 1982, p. 11)

In/Visible Women

The exclusion of women from western science is chronicled in A World Without Women, a history of the clerical culture from the inception of Christianity through the second millennium. "The male monopoly on science is no mere relic to be easily tossed aside. Throughout most of its evolution, science has not simply excluded women; it has been defined in defiance of
women and in their absence. The field has remained an alien world for them, one where they face not just discrimination but dread.” (Noble, 1992, p.54) Noble details the history of androgynous Christian asceticism through the patriarchal monopoly of classically educated and university trained clergymen to “In vitro fertilization and embryo transplants... a womb for men... the telltale preoccupation of a womanless world” (Noble, 1992, p.286). It is in the final chapter, “Women in a World Without Women”, where women’s contributions, albeit associated with American religious revivalist movements and the demands of industrial capitalism in the nineteenth century, reveal themselves in the history of education and science transformations. Although the lives of individual women and women, in general, figure in these transformations, their stories are not the ones that have earned a place on the pages of my textbooks.

Religious revival held great appeal for women, because it defied the authority and misogynous precepts of the all-male clerical hierarchy, broke down social barriers between devout men and women, and enabled women to come to the fore on their own behalf to challenge existing institutions, on appeal to a higher authority. The evangelical ethos of spiritual equality before God translated readily into a call for greater social equality, including access to higher education. (Noble, 1992, p. 250)

I see technology as today’s newly defied authority; its clerics are overwhelmingly male. Devotion to this authority brings power and prestige to the devotees. Technology’s heritage has few women serving as symbols for what is possible. There are barriers. Not everyone is welcomed into the established hierarchy. These barriers are tangible, yet in/visible, to those who have tried and are trying to gain admittance. With this thesis, I am seeking to explore this enigma and provide myself with a key to a different actuality.

Shepherd’s Lifting the Veil contains a personal account in addition to
'personable' accounts of women's experiences of prejudice in science. Shepherd writes of the alternatives to the hierarchy and speaks to expanding the diversity of participants and to appropriating technology in the social and cultural contexts where women live and work. She questions the mechanics of perception and the ideal of objectivity so prevalent in the masculine philosophy which constructs the knowledge known as science. Shephard urges that the gatekeepers of knowledge be challenged; that a feminine face of science be pursued; that intuition, nurturing, cooperation and collaboration be embodied in a multidisciplinary approach leading to social responsibility. It appears that the study of women, whether it be in the world of science or education, requires something more than lifting the veil of ignorance.

But it is obvious that the values of women differ very often from the values which have been made by the other sex; naturally, this is so. Yet it is masculine values that prevail. Speaking crudely, football and sport are 'important'; the worship of fashion, the buying of clothes 'trivial'. And these values are inevitably transferred from life to fiction. This is an important book, the critic assumes, because it deals with war. This is an insignificant book because it deals with the feelings of women in a drawing room. A scene in a battlefield more important than a scene in a shop - everywhere and much more subtly the difference of value persists. (Woolf, 1929, pp. 80-81)

Science is representative of those "intellectual disciplines into which a person must be initiated to become an educated person, exclude women and their works, construct the female to the male image of her and deny the truly feminine qualities she does possess." (Martin, 1993, p.74) Despite governmental and academic attention to women in science and technology, when the numbers of women and men participants are compared, women are missing. "Although governments have implemented a number of initiatives in support of the goal of equality, women remain significantly under represented in scientific and technological occupations. This inequity
prevents women from participating fully and equally in Canadian society in
general and the labour force in particular.” (Status of Women Canada and
Manitoba Women’s Directorate, 1989, p.i) Individuals, groups of researchers
or organizations (such as the National Science Foundation, 1988, 1990, 1992;
the National Research Council, 1989, 1990; or the U.S. Congress, Office of
Technology Assessment, 1988a, 1988b; referenced in Clewell, Anderson, &
Thorpe, 1992) and the Science Council of Canada, 1981, 1984; and Equality in
Employment, A Royal Commission Report Abella, 1984; referenced in Status
of Women Canada and Manitoba Women’s Directorate, 1989) provide more
detailed evidence of the under representation of women in math, science and
technology. Women find obstacles in science as a discipline, as well as in
science as a place of work. (Shepherd, 1992; Harding, 1986; and Harding,
1991, as referenced in Shulman, 1994) In British Columbia, women teachers
in secondary schools are in the minority in similar key areas: computer
education (10.6%), mathematics (20.9%), and science (17.8%). (Ministry of
Education, 1991, p.8)

The questions that we have to ask and to answer (about this
inequitable) procession during this moment of transition are so
important that they may well change the lives of all men and
women for ever. For we have to ask ourselves here, and now,
do we wish to (continue this) procession, or don’t we? On what
terms...? Above all where is it leading us, the procession of
educated men?... the questions must be answered. (Woolf,
1938, p.72)

Realities: Attempting an Epistemological Frame

Imaginatively she is of highest importance; practically she is
completely insignificant. She pervades poetry from cover to
cover; she is all but absent from history. She dominates the
lives of kings and conquerors in fiction; in fact she was the
slave of any boy whose parents forced a ring upon her finger.
Some of the most inspired words, some of the most profound
thoughts in literature fall from her lips; in real life she could
hardly read, could scarcely spell, and was the property of her husband. (Woolf, 1929, pp. 49-50)

Franklin’s (1990) conceptual separation of reality into the vernacular, extended, constructed or reconstructed, and projected forms, all profoundly affected by science and technology, has influenced considerations of the possible effects of technology on women and girls in education.

According to Franklin’s model, vernacular reality consists of direct action and the immediate; experience which is private and personal and common and political. It is vernacular reality which offers validation of my senses and experiences around technology giving me permission to relate my experiences and perceive them as real and valid as well as giving purpose to this thesis. Extended reality, as a body of knowledge and emotions is acquired from the experiences of others. It is often found in museums, through their artifacts, or from the experiences of the well-travelled, and in the stories of the aged. As a society we draw on extended reality for continuity, often substantiating our “newly found” knowledge in the citations of research. It is through the “products” of extended reality that the historical connections of women to technology are brought to bear in later a later section of this paper. Moreover, extended reality offers me justification beyond academic protocol to use the words and ideas of others. Constructed or reconstructed reality weaves a common archetypal culture which is the interpretive and descriptive fabric of institutional behaviour and serves to sanction the status quo or support the controls imposed by those invested with power. It is the practices which pattern the archetypal culture which draw me to examine the patriarchal hegemony so prevalent in educational institutions and likely in the culture in which I work. Projected reality, influenced and caused by actions in the present, is the vernacular reality of the future. Projected reality is represented in the plans for the future, and in the case of this thesis, in the
technology plans crafted by the school districts providing sufficient "reason" for my interest in provincial and district plans. Since plans are examples of projected reality, they can and do influence people's attitudes and actions. In the present is the future. It is my belief that if the future is to be influenced, the plans of the present ought to contain evidence that "omissions" from the past are included in the plans of the present.

**Science & Technology**

I am concerned that the introduction of new technologies to education will follow the gendered pathway trodden by its predecessors, (math and science) and that technology as practice, as well as, technology as tool will be irrevocably uni-gendered. Before establishing the likelihood of this theorized concern, the connection between science and technology ought to be made more explicit.

Dualisms, such as culture vs. nature, mind vs. body, reason vs. emotion and objectivity vs. subjectivity, are common in the androcentric ideology of contemporary science. In each case the latter has been systematically associated with the feminine whereas the former have been readily accepted as preferred and associated with the masculine. Feminists, like Harding (1986), have questioned these gendered dualisms as well as the legitimacy of Western science's epistemologies as a set of philosophical givens and their inherent immunity to social influence. The knowledge claims and practices of modern science were defined and located as examples of scientific objectivity and transcendental truths in the "malestream" Western culture of science. Feminists, on the other hand, located 'scientific' objectivity within
gendered, socially structured (race, class and culture), and political settings. Science and technology are multifaceted and include practices as well as bodies of knowledge and structures as well as the act of structuring. Theirs is a symbiotic, side by side, relationship. Because their complex interconnectedness defies simple cause and consequence metaphors, the influence of science and technology in reordering and restructuring social relations between nations, groups and individuals as well as between people and their environment has been often overlooked. In 1970, Thomas Kuhn introduced the premise that scientific knowledge is profoundly affected by the society in which it is conducted. Slowly, an awareness of the socio-political, historical, geographic, economic and gendered contexts of science is emerging. Nevertheless, in the West, science and technology represent an accepted way of separating knowledge from experience, deriving the general from the particular, and permitting the application of general rules and laws such that the system or “experience” is isolated from its context, and this is often achieved through the omission of essential considerations of context. These actions continue to invoke “questions of reductionism, of loss of context, and of cultural biases (which) are cited quite frequently by critics of the scientific method.” (Franklin, 1990, p.39) The human and social effects of the separation of knowledge from experience can be debilitating from a human point of view. Franklin believes it should be “the experience that leads to a modification of knowledge, rather than abstract knowledge forcing people to perceive their experience as being unreal or wrong”. (Franklin, 1990, p.40) As I analyze the district technology plans I will be searching for an understanding

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4 It is not my intention to imply a single unitary voice for feminists and feminism’s in this paper. Although I recognize that there are many conceptualizations espoused in the use of the terminology, the intent of this research paper is to examine the socio-cultural relationships of women and girls within education and to place this information alongside what is known about women and technology rather than to differentiate specific feminist perspectives on this issue.
of the human and social effects of the introduction of technology.

Donna Haraway has carefully described the flawed objectivity of science and technology prevalent in mainstream Western scientific culture. She argues for an enhanced objectivity where mind, body and tool are on very intimate terms; where the difference between machine and organism is purposely blurred in order to expose partial, politicized, deterministic perspectives. Herein rests the projected reality which I use in my examination of district technology plans in Chapter Three. To assume that Haraway’s work is unlikely reading for those charged with the task of creating district technology plans would be, I believe, reasonable and for this reason I would be surprised if I were to find any evidence of questioning about how technology is “viewed”. Regardless of the presence or absence of questioning in the technology plans, Haraway’s work encompasses a vital balance that ought to be evidenced within effective policy and technology planning.

The ‘eyes’ made available in modern technological sciences shatter any idea of passive vision; these prosthetic devices show us that all eyes, including our own organic ones, are active perceptual systems, building in translations and specific ways of seeing, that is ways of life. There is no unmediated photograph or passive camera obscura in scientific accounts of bodies and machines; there are only highly specific visual possibilities, each with a wonderfully detailed, active, partial way of organizing worlds. All these pictures of the world should not be allegories of infinite mobility and interchangeability, but of elaborate specificity and difference and the loving care people might take to learn how to see faithfully from another’s point of view, even when the other is our own machine. That’s not alienating distance; that’s a possible allegory for feminist versions of objectivity. Understanding how these individual systems work, technically, socially and psychically ought to be a way of embodying feminist objectivity. (Haraway, 1991, p.190)

**Women and Technology**

And if I could not grasp the truth about W...in the past, why
bother about W in the future? It seemed pure waste of time to consult all those gentlemen who specialize in women and her effect on whatever it may be-politics, children, wages, morality-numerous and learned as they are. One might as well leave their books unopened. (Woolf, 1929, p.36)

Langdon Winner (1985) describes technology as the "digitized footprints of social transactions". This description seems appropriate for both science and technology, especially when applied to their practices, their institutions and knowledge. These footprints trace the exclusion and inclusion of various participants. The prototype inventor is male. Women are, as they were in science, hidden from the official history of technology. Their contributions to technology seem inconsequential in light of the male bias and patriarchal values embodied in key narratives of Western technology.

The story of Ada Lovelace provides an example of how patriarchal values often play themselves out when accounting for the roles of women in Western technology. Ada lived from 1815-1852. Her fame lay in her parentage\(^5\); her notoriety spread with her affairs. The genius of Ada Lovelace was "poetical science".\(^6\) She

Fig. 2.5 Ada Lovelace

\(^5\) Lord Byron was her father.
\(^6\) Ada was able to express her understanding of Science and Mathematics using apt metaphors and visual examples. She used imagination and metaphor to accurately and succinctly capture a concept or an idea. The Industrial Revolution saw objectives expressed as scientific truth, digital skills and reason. These were values and skills Ada’s mother demanded of her. The imaginative, intuitive and humanistic skills were seen as emotional subjectivism (and thus of little value to science). Although Ada never knew her father, she understood the Romantics and was able to represent their values. Her talent is represented in the following excerpt: “The distinctive characteristic of the Analytical Engine, and that which has rendered it possible to endow mechanism with such extensive faculties as bid fair to make the engine the executive right-hand of abstract algebra, is the introduction into it of the principle which Jacquard devised for regulating, by means of punched cards, the most complicated patterns in the fabrication of brocaded stuffs. It is in this that the distinction between the two engines lies...we may say most aptly that the Analytical Engine weaves algebraically patterns just as the Jacquard-loom weaves flowers and leaves.” (Toole, 1992, p. 248)
anticipated the future of Babbage's Analytical Engine accurately describing the modern computer and its ability "to store a program (a sequence of operations or instructions) as well as data (informational values themselves)...she recognize(d) the... responsibility this new capability placed upon the machine's user, to specify the stored program both precisely and in complete accordance with the user's interest." (Toole, 1992, p.248) It is this insight which is referred to today as software development. Ada's contribution was officially recognized when the American military named a computer language after her in 1980, and the United States Department of Defence took "Ada" as their trademark in 1984; a tribute, of dubious merit.

My angst concerning this tribute is threefold. The first reason is the appropriation of a British Ada Lovelace for the trademark of the United States Department of Defence. The second reason is the minimization of Ada's true accomplishments and insight and the implication by association that hers was a military "mind". The third reason, and possibly the greatest irony of all, is the unequivocal military origins and its massive financial support of research in educational technologies (Noble, 1992). This digression serves another purpose because there is a legacy associated with this particular association. Until very recent times the military culture has been to all intents and purposes, a "world without women".

One thing, in any event, is clear: The influence of military research has been arguably the most historically significant and the least acknowledged influence, both on computer-based education specifically and on the alignment of education with technology, more generally. (Noble, 1992, p. 192)

Our cultural artifacts have been constructed over the course of human

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7 There is perhaps more apt tribute to be found in The Ada Project at: http://www.cs.yale.edu/HTML/YALE/CS/HyPlans/tap/tap-biblio.html
history. It is these cultural artifacts which mediate all human activity. Scott, Cole and Engel (1992) question and caution us to think and to assess the equation of “computers equal quality” in education. This assessment is especially pertinent when one considers that these man-machine systems were developed to improve military training and embodied “presupposed fixed tasks and goals and a restricted range of social arrangements of a top-down authoritarian nature” (p.193).

Since the days of Ada Lovelace women have likely contributed to computer programming and software development. Their contributions are undocumented and all but in/visible. American women, however, did make enormous contributions to the programming of the first operational computer in the early 1940’s. Programming was initially viewed as low status, clerical work. Recruited by the military, women worked as trained mathematicians tediously calculating by hand firing tables for rockets and artillery shells coding and programming this information into ENIAC. Complex skills were developed as a result of this challenging work. As this occurred, this work came to be considered “creative, intellectual and demanding”. Men discovered its complexity and challenge, as well as its “cash” value. The ramification was that hard-working women were phased out of their jobs and the names of these recent pioneers are not known to us. (Perry & Guber, 1990)

The juxtaposition of horticulture, cooking and childcare as consequential topics for discussion when writing about technology appears somewhat absurd following a paragraph on the cultural influence of the military and the immense contribution of the ENIAC women to World War II. Yet the fact that the women associated with these technologies are normally in/visible remains a common and conspicuous omission. I have included the examples of horticulture, cooking and childcare because of their unexpected association, at least at first glance, to technology and their blatant
predisposition to be seen as the "unskilled" work of women.

Before examining this tenuous link, a clarification of what is meant by technology is required. In this paper, technology has at least three layers of meaning. The first layer, the most ubiquitous, sees technology defined as tool or hardware, a physical object. Whereas in the second layer, technology operates as a system, wherein its processes and procedures constitute the design, production and distribution of the product or tool and frame the system referred to as technology. In this layer end users of the technology have virtually no control over the system. Thirdly, technology is defined as a form of knowledge. The usefulness of the appliance fashioned from metal, plastic and silicon, otherwise known as a computer, is obviously in doubt without programs and programmers. (Wacjman, 1991) Technology, in and of itself, has no meaning but neither is it neutral or apolitical. A technology of knowledge, a visual, tactile knowledge that is much more than a simple verbal or written instruction and more than a mathematical, engineered description, must accompany the technology in order for it to have meaning. Knowing how and when to use technology as well as how to repair and adapt it to specific situations is something that is not easily captured in the pages of a manual or in the talk of the classroom. Heather Menzies (as quoted in Smythe, 1987) adds to this description yet another dimension which brings to light the social values associated with the deployment and development of technology:

So, when I see, technology, I see not just the techne -- the technique or tool on the table before me; I see also the logos -- the web or system of social relations and organizations, the assumptions and values which provided the rational framework for developing and deploying the final product. (Smythe, 1987, p.22)

Technology, in this third layer, is part of culture (Morley and
Silverstone, 1990, referenced in Mackay, 1991). Within the culture the user may appropriate the technology for purposes that differ from the designer's intentions, however, the scope of the appropriation will always be quite limited. Technology is encoded in terms of its function. Already its meaning to the consumer has been taken into account in the early stages of the design. Mackenzie and Wacjman (1985), Cockburn (1985) and Cockburn and Ormrod (1993) argue that economic, social and political choices are embedded in the design, selection and distribution of technology. The distribution of power and resources within the society are in fact mirrored in the three levels of technology. Technology is a human and social endeavor (David Noble, 1984 as cited in Wacjman, 1991, p.22).

It is at this juncture that the myth of the "inevitable trajectory of 'progress' " (Mackay, 1991, p.7) ought to be formally acknowledged and countered. It is a common assumption in technological determinism discourse that society is shaped and entrenched in a causal relationship whereby the inhuman technology induces social change. Technology is inexorably shaped by the development of new scientific ideas which simply follow from the progression of work within the scientific and technical fields. Such an assumption breeds a passivity that diverts questioning the human and social effects of the technology at the outset as well as examining the technology in relation to human need. Another prevailing assumption resulting from technological determinism is that technology is an invaluable tool which increases productivity. The social change is merely the modification made by people as they receive training, adjust and bridge the unemployment fluctuations.

Dowling (in Mackay, 1991, p.6) argues that technology in education is a cultural phenomenon; technologies are defined by their cultures rather than particular cultures defined by their technologies. The hyperbole, surrounding
the introduction of new information technologies in education, claims unproblematically that technology will serve as a change agent transforming schools, teaching and learning (Means, 1993; O'Neil, 1995; Miller and Olson, 1995). If indeed this is true, what plans have been made to support this transformation? Perhaps more importantly, do plan makers understand and respect the human and social complexities of teaching and learning enough to predict and support the outcome and effects of new technologies on their teachers and students? When attention is shifted from the production to the consumption of technology, Kling has found that all too often the uncritical celebratory discourses ought to have been challenged because the technologies and their related social arrangements have the power to enable, facilitate, inhibit or catalyze other social changes (Kling, 1991, 1992, as referenced in Cockburn and Ormrod, 1993, p. 11). Education as a social institution has a responsibility to “resist the siren call” of technology and its idealized, abstract vision of computer use [information technology]. What trade-offs are being made in selection and use of particular technologies (Miller and Olson, 1995, p. 76)? Is anyone asking these questions as they plan to infuse technology into the school system?

My earlier reference to the technologies of horticulture, cooking and childcare may still appear tenuous especially when my intent is to examine the introduction of new technology through district plans in British Columbian schools. Their placement in this paper is not only to emphasize their absence from the traditional histories of technology but also to suggest that a similar absence of women will be paralleled in the introduction of new technologies in education. Who will have access? What subjects and places will be deemed “important” to infuse with technology? An examination of the

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8 See Chapter Three for detailed accounts of British Columbian public documents.
Technology Education\textsuperscript{9}, Information Technology and Science Integrated Resource Packages supports the contention that women are missing in both content and resources.

**Herstory, Illusion and Truth**

Historically, women have been largely excluded from the invention, design, and control of technology, as well as from positions of authority in institutions which shape the use and disposition of technology. “The indices to the standard histories of technology...do not contain a single reference, for example, to such a significant cultural artifact as the baby bottle. Here is a simple implement...which has transformed a fundamental human experience for vast numbers of infants and mothers, and been one of the more controversial exports of Western technology to underdeveloped countries - yet it finds no place in our histories of technology” (Ruth Schwartz Cowan, 1979 as quoted in Wacjman, 1991, p.17). What if we were to add the technologies of the baby carriage; toilet training, before and after indoor toilets; and disposable diapers to the mix. All, are still awaiting their historians (McGaw, 1982 as cited in Mackenzie and Wacjman, 1985, p.175).

Furthermore, these gendered technologies have had a profound effect on socio-economic institutions just as did women’s early achievements in horticulture and agriculture. Will our female students have to wait until they take a women’s studies course to learn the contribution of women to the scratch plow, the reaping knife, grafting, hand pollination and early irrigation? These all constitute technology. From the earliest human times women were the main gatherers, processors, and storers of plant food. They should have been the ones to have invented the tools and methods involved with this work, yet

\textsuperscript{9} In fact, Patricia O’Riley’s(1991) unpublished Masters Thesis has supported this
credit is sorely lacking. The nature of women's inventions, and those of men, is a function of time, place and resources; a fundamental truth too often overlooked. Will our students, specifically our female students, see themselves reflected when learning about the contributions that women made to the inventions of the cotton gin, the sewing machine, the small electric motor, the McCormick reaper, and the Jacquard loom (Stanley, as cited in Wacjman 1991, p. 17)? Women “have almost always been 'hidden from history' ... [when] the historians were men” (Autumn Stanley, 1983, as referenced in Mackay, 1991, p.45).

Since 1995 information technology (IT), a cultural artifact, has been targeted for funding and is being publically\(^\text{10}\) introduced into schools. Like the sewing machine, the microwave, and the baby bottle before IT, our culture will resonate with its effects. The district technology plans and their subsequent deployment of money, technology and knowledge may perhaps serve as another illustration of the introduction of technology as a gendered, negotiated system. The plans, like the technology they speak of, are also examples of cultural artifacts. Because I see them as artifacts of a gendered technological system that is already in place, I strongly believe that another gendered technology system is being recreated in schools.

"An artifact may be looked on as the 'congealed outcome' of a set of negotiations, compromises, conflicts, controversies and deals that were put together between opponents in rooms with...lathes or computer terminals" (Law, 1987, as quoted in Wacjman, 1991, p. 23)

[Wacjman continues...] Because social groups have different interests and resources, the development process brings out

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\(^{10}\) Technology has been introduced into schools before this public and political introduction in 1995. The difference at this juncture is that the funding is targeted and the promise of technology for schools is a visible political platform for the current British Columbian government.
conflicts between different views of the technical requirements of the device. Accordingly, the stability and form of artifacts depends on the capacity and resources that salient social groups can mobilize in the course of the development process. (Wacjman, 1991, p.23)

Women's exclusion from high status technologies has been documented from the early phases of industrialization through to now (Faulkner and Arnold, 1985; McNeil 1987; Braverman, 1974; Cockburn, 1983 1985; as referenced in Wacjman, 1991, p.20). As Giroux suggests there are some decisions to be made in relation to this marginalization as follows:

If we are to take human agency seriously, we must acknowledge the degree to which historical and objective forces leave their ideological imprint on the psyche itself. To do so is to lay the groundwork for a critical encounter between oneself and the dominant society, to acknowledge what society has made of us and decide whether that is what we truly want to be. (Giroux, 1983, as quoted in Weiler, 1988, p.74)

It is unlikely that access to formal knowledge alone will furnish the location or the resources necessary for learning about technology. There is no one reason why women actively resist entering fields which use computer technology just as there is no one answer for reversing this long standing absence of women. As in science, the language, symbolism and stereotypes of technology are appropriated as masculine. Because there is more to joining the culture of technology than acquiring skills, both at school and in the workplace, the culture of technology will require modification. It will not be enough to simply add in the women (Cockburn, 1985; Wacjman 1991).

On an educational (Skills Now!11) field trip, to a machine shop at a

11 Skills Now! was an initiative from the Ministry of Education which also represented an infusion of money and required a “plan” in order to receive further funding installments. In addition districts were visited by an “audit” team to determine that the programs were in place and that the money was being spent as written in the “plans” The purpose of this initiative was to include credited work experience for high school graduation. Students were
lumber mill I was the first person through the door. As I stood and scanned
the room around me I remember taking a deeper breath than usual. I was
awed. This was my first "enlightened" experience in what I knew was a male
enclave; intrigued to see machinery I had only heard about; and yet I was
without any doubt that women did not and could not work in the place where I
stood. I knew this because as my eyes swept the room, the tour leader and one
of the mill's employees scurried to shut away the many pictures of naked
women pinned to the shop doors. I saw. They saw me see. They smiled. I
returned their smiles, remaining the ever polite, submissive, acculturated
woman. This was not the mill's first tour of teachers involved with career
education nor was it the last. How will the young female apprentice feel when
she sees her identity projected on the wall? "We find the continual asymmetry
underlined by Harding: masculine and feminine exist always in relation to
each other but are never equivalent and cannot be treated as though they
were. To construct the masculine is to differentiate it from something of
lesser value called the feminine" (Wacjman, 1991, pp. 6-7). Wacjman raises
a pertinent question: how do we avoid the tautology that technology is
masculine because men do it?

Ursula Franklin advocates for women "to actively preserve a sense of
their different vision against the risk of assimilation into the prevailing
[science and technology] culture and value system" (Smythe, 1987, p.25).
When I heard Ursula Franklin speak several years ago I came away inspired.
She has taught women on welfare the science they needed to speak
knowledgeably and competently about environmental issues concerning
to be encouraged to explore career alternatives in addition to the traditional
university/college programs. Work experience was seen as a means to open doors to new
career preparation programs and apprenticeship programs.
12 "Enlightened" in this context means that I have read feminist theory and am able to
deconstruct my experiences from a theoretical perspective.
Ontario Hydro. This suggests to me that the “curriculum” was inclusively designed and contextually framed to include women. Franklin would have included feelings in her teaching as did Barbara McClintock and Anne Connway (17th Century) when they practiced science with a feeling for the organism. I know she would have given public demonstrations as did Ellen Swallow (19th Century) on how to test water for pollution. Franklin spoke of a need for a “paradigmatic shift”, a need to move away from a perspective which reifies the technical and cognitive aspects to one which includes the social, interactionist, and cultural” (Benyon, 1991, p.11).

Life for both sexes...is arduous, difficult, a perpetual struggle. It calls for gigantic courage and strength. More than anything, perhaps, creatures of illusion as we are, it calls for confidence in oneself. Without self-confidence we are as babes in the cradle. And how can we generate this imponderable quality, which is yet so incalculable, most quickly? (Woolf, 1929, p. 40)

**Education, New Technologies & Scuttled Truth**

Yet it is in our idleness, in our dreams that the submerged truth sometimes comes to the top... Anger had snatched my pencil while I dreamt. But what was anger doing there? Interest, confusion, amusement, boredom - all these emotions I could trace and name as they succeeded each other...It referred me to the one book, to the one phrase, which had roused the demon; it was the professor's statement about the mental, moral and physical inferiority of women. My heart had leapt. My cheeks had burnt. I had flushed with anger. There was nothing specially remarkable, however foolish, in that. One does not like to be told that one is naturally the inferior of...man... (Woolf, 1929, p.37)

Revealing the gendered reality of technology in education is especially meaningful when I experience overt and subtle obstacles in seeking active membership in the computer culture. A quiet flush of anger has too often
been my companion as I make my illusive way to belonging. It is my wish to open "locked cupboards" for my colleagues and other women teachers and their female students, although I am unsure that the gendered reality of technology has or will have significant meaning to others in education. I know this to be true because as an instructor I have introduced the topic of gender equity in science workshops and in a recent university course on information technology, and each time, have met with contemptuous antagonism despite my efforts of wrapping the information in “local” bona fide research reports such as The 1990 British Columbia Mathematics Assessment and The 1991 British Columbia Assessment of Science. I have included other government publications such as Gender Equity: Distribution of Males and Females in the British Columbia School System and the Ministry of Education, Skills and Training’s cross-curricular outlines, common to all Integrated Resource Packages, which include a section on gender equity. When I venture into reports such as We’re here, Listen to us! (Holmes, 1992), A Capella (Robertson, 1990), and How Schools Shortchange Girls (Wellesley College Center for Research on Women, 1992) my colleagues wish vehemently to argue that the information contained in those reports is blatantly false or inaccurate. Despite the available documentation and evidence to the contrary, there is a trenchant inclination to believe that the problems associated with gender equity do not exist in “their” classrooms or “their” schools. When I talk about or ask questions regarding gendered technology and the existent problems associated with introducing new technologies in schools, I see nothing but my reflection in glazed eyes. When I compare my questioning the patriarchal supremacy of technology in my small sphere of influence to Franklin’s analogy of questioning the Pope during the Reformation I am humbled by the enormity of the latter task.
In the real world of technology, I think, we would be well advised to question the authority of the images in the manner in which the Reformation questioned the authority of the Pope... because... (it was) the doctrine and the religious teaching (that) was the authority which prescribed the conduct of social and political relations. The reformation challenged the authority of the Church to be the sole arbiter of individual conduct beyond the individual's own conscience and discernment. Today technological rationales have very much the force and authority of religious doctrine, including the notion that the laity is unfit to question the doctrinal content and practice. (Franklin, 1990, p. 44)

The future is seeded in the present. Because I know about the inequities associated with gender and education, I find myself ethically challenged in my new role as a coordinator of technology and information services to actuate a gender equitable introduction to new technologies. I also know that these inequities will likely be replicated with the introduction of new technologies. It is for these reasons that I ask: what is it that could be more important than gender equity? Earlier in this chapter I have alluded to my belief that we have progressively traded the authority of the Church for the authority of science and once again are busy interchanging the authority of science for the authority of technology. Women are not and have not been equal partners in this exchange. Hence my desire to look to the circle where I might have some small influence.

**Gender Equity: A Definition**

Before proceeding to the argument that technology is gendered in education, as is education in general, I include the November 1990 statement of understanding written by the Gender Equity Advisory Committee of the British Columbia Ministry of Education to indicate my use and interpretation of the term gender equity. It is in this expanded definition emphasizing social, cultural and economic equalities that I find affirmation that it is morally desirable to work towards improving the learning conditions of my
female colleagues and their female students because in the end all will benefit. I have no illusions that this is an achievable or finite task, for the inequities represent the socio-cultural foundations upon which the institution of education has been built.

What does this understanding mean for this research paper? For me it means that the promotion of gender equity in education will require consequential changes and substantive intervention in policy and practice. There is substantial evidence that each of the areas cited: curriculum, instruction and assessment; social interaction within the school setting; institutional conditions and structures and the socio-cultural context of public education are all problematic in education when assessing for gender equity or for new technologies.

Gender equity is concerned with the promotion of personal, social, cultural, political and economic equality for all who participate in the education system of British Columbia. The term gender equity emerged out of a growing recognition in society of pervasive gender inequities. Continuing traditions of stereotypical conceptions and discriminatory practices have resulted in the systemic devaluation of attitudes, activities, and abilities attributed to and associated with girls and women.

The negative consequences of stereotypical conceptions and discriminatory practices adversely affect males as well as females. However, in the short term greater emphasis in the gender equity initiatives will be placed on improving conditions and attitudes as they affect girls and women. In the long term, these initiatives will also improve the situation for boys and men.

Gender equity, as distinct from sex equity, is not attainable solely by a quantitative balancing of females and males in all aspects of the existing system. It must entail, also, a qualitative reworking of gender assumption within all aspects of the present system itself - both formal and informal. Concretely, this means promoting gender equity in curriculum, instruction and assessment; social interaction within the school setting; institutional conditions and structures and the socio-cultural context of public education. (Ministry of Education,
Our institutions and culture shape young people's assumptions, experiences and understandings affecting their actions as they move through school towards the workplace reproducing existing inequalities. The impact of which effects both teachers and students (Gaskell, 1991). Gaskell poses two very important questions about the existing structure of schooling: "who is served and who is not" (Gaskell, 1991, p.33)? Her work examines the unequal relations of class and gender in the structure of schooling and its relationship to the work-place. Her excerpts from interviews reminded me that the effects of our practices and policies in education are felt by real people. When reading what my muse wrote of Charlotte Brontë's Jane Eyre, I was further reminded of something far more consequential than my personal anger. Too often, buried in the personal stories of women and men, the influence of ignorance, oppression, fear and pain reverberates through the choices that were and are available to them in our current system.

But there were many more influences than anger tugging at her imagination and deflecting it from its path. Ignorance, for instance. The portrait of Rochester is drawn in the dark. We feel the influence of fear in it; just as we constantly feel an acidity which is the result of oppression, a buried suffering smoldering beneath her passion, a rancor which contracts those books, splendid as they are, with a spasm of pain. (Woolf, 1929, p. 80)

**Unveiling The Rhetoric of New Technologies**

The introduction of new technologies is hardly new to education, and nor is the exuberant embracing and reification of the politicized hype. The introduction of new technologies into education does not and did not begin with the computer. New technologies - film, radio, television and computers have all shone in the spotlight of promise: the promise of revolutionary
change, the promise of greater efficiency and effectiveness and the promise of engaging our children in learning like never before. Cuban's (1985) book, *Teacher and Machines*, chronicles the disparity between the promise and the real world of the classroom. A common pattern is seen. First the heralding, then the limited introduction and adoption and finally, the fall into disuse. Cuban's machines reside in every school. They serve as reminders of previous implementations of technology. Will the educators who are the planners of the district technology plans glean anything from these recent lessons of history?

It has been found that teachers reject or at least resist change because of failure to recognize the need for improvement, fear of experimentation, unwillingness to give time, and disillusion or frustration with past experiences. In addition teachers traditionally tend to be conservative and usually will not be impressed by the results of investigations and research or new theories of education. (Javad Maftoon, 1982, as quoted in Cuban, 1985, p.51)

Sixty plus years of experience with classroom machines and now, the tacit politicized push\(^{13}\) to add computers and computer networks to the schools. Are we forever doomed to repeat history? Cuban's (1985) book identifies four areas which influence the adoption of new technologies and teacher practice. I can't help but wonder if these categories will be reflected in the Ministry's requirements for district technology plans and if not there, then will the district plans themselves reflect the wisdom of historical accounts.\(^{14}\)

The first area Cuban considers is the nature of the innovation and its


\(^{14}\) This query is not meant to be pejorative or facetious. I am serious. My personal bias is reflected in this question. As an educator, I want to believe that our education leaders and bureaucrats ground their decisions and policies in well founded research and knowledge. I want to believe that we as educators are learners. I want to see the evidence of what I believe is our responsibility to the citizenry and our students. I admit my naivété.
relationship to the accessibility of the hardware and software. This relationship can play itself out in a number of arenas; for example, the adequacy/inadequacy of the equipment and programs, the ease or difficulty of use and the convenience/ inconvenience of the facilities in which the equipment is housed. Always overlooked, rarely considered and extremely contentious is the measurement of teacher's time in relation to the nature of the innovation. Time to learn, time to access, time to plan, time to practice, time to reflect...Time, a critical and precious commodity in the world of business; not so, when applied to teachers in education.

Implementation is the second strategic area to be considered in the adoption of an innovation especially if classroom practice is to be influenced. The consideration of classroom routines and teacher beliefs are essential, otherwise, the response to mandated change/ adoption is rarely more than token compliance. Perhaps the most revealing feature of the implementation plans will be their goals. What do they reveal about how “outsiders” think about the work ( and worth) of teachers?

The third and fourth strategic areas are represented by Cuban's term “situationally constrained choice”. The work place setting, both “school and classroom structures and the culture of teaching including the social and individual beliefs of teachers” (Cuban, 1985, p.63) establish boundaries and shape the context of teachers' work thus contributing to the daily pedagogy of teachers. The versatility, simplicity and efficiency of new technologies are therefore measured against the versatility, simplicity and efficiency of textbooks, worksheets and chalkboards. The tangible practicalities of scheduling, portability, accessibility, space, expense, time, prescribed content, assessment, adaptability and student control are the ever demanding realities of the work place which shape teacher behaviour. The benefits of new technologies have to eclipse the practiced responses to the fervent rigors of the
classroom and school setting. The teacher's perspective is at the core of the decision making process when assessing the introduction of new technologies. Their adoption or rejection is dependent on their relevancy to problems that teachers themselves “define as important and avoid eroding their classroom authority”. They will either resist or be indifferent to changes that they see as irrelevant to their practice, that increase their burdens without adding benefits to their student’s learning, or weaken their control of the classroom (Cuban, 1985, pp. 70-71).

So often the introduction of new practices, new curriculum and new technologies is framed in compelling language. Language which extols the value of the new, the innovative, the high-tech for the welfare of students guaranteeing a skilled, productive future. Contradicting this motherhood idealism is akin to heresy and treason. Yet, challenging questions have to be asked. But, whose questions count?

...Teachers ask very different questions of new classroom technologies than do administrators, school board members...and scholars. Teacher questions are anchored in the classroom...Policy makers who adopt innovative technologies and ship them into classrooms ask very different questions about productivity, equity and cost. (Cuban, 1985, p. 67)

...it is not always clear, at least in the early stages of a technology’s intrusion into a culture, who will gain most by it and who will lose most. This is because the changes wrought by technology are subtly if not downright mysterious, one might even say wildly unpredictable... [experience demonstrates that] new technologies alter the structure of the things we think about...They alter the character of our symbols: the things we think with... And they alter the nature of community: the arena in which thoughts develop. (Postman, 1993, pp. 19-20)

The preceding quotations offer a glimpse into a recurring, and as yet, unstated theme that courses throughout this thesis. The subject is gender
but the practices, conceptual and relational, are manifestations of power, elusive technological imperialism. I suspect that Heather Menzies (as quoted in Smythe, 1983) is alluding to a concept of power when she comments on the changing relationships between technology and knowledge:

what about the technologies of begetting and accrediting of knowledge... the gatekeepers... those who allow or disallow new information... the established frame of reference in relation to which one positions oneself even if it's not in opposition... what choices have been excluded.... the main thing I've learned is to be aware of the context when talking about technology. This includes the knowledge, the understanding, and the related biases and assumptions out of which new technology emerges and against which it is applied, as well as the perceptions of technology held by the general (or particular) public depending on how and by whom it is portrayed. (p. 27)

Chapter Three develops this theme in more detail as the relationships between the introduction of new technologies and policy are examined. Before proceeding to Chapter Three, it is important to “be aware of the context when talking about technology” by unraveling the conditions represented by following questions: How do computers live in schools? Who are the experts? Are new technologies engendering a ghetto?
Educational Settings and New Technologies

...she had no separate study to repair to, and most of the work must have been done in the general sitting-room, subject to all kinds of casual interruptions...Jane Austin hid her manuscripts...would Pride and Prejudice have been a better novel if Jane Austin had not thought it necessary to hide her manuscript from visitors? I read a page or two to see; but I could not find any signs that her circumstances had harmed her work...That, perhaps, was the chief miracle about it. Here was a woman about the year 1800 writing without hate, without bitterness, without fear, without protest, without preaching...It was impossible for a woman to go about alone. She never traveled; she never drove through London...perhaps it was not the nature of Jane Austin to want what she had not. (Woolf, 1929, pp. 73-75, my emphasis)

Technology in the Schools

Although computers have been part of the school environment for close to 20 years, classrooms have emerged ever resilient to change. The much heralded promises of transformation through the introduction of technology have failed to be realized with new technologies being used in ways consistent with old practices reproducing existing inequities (Cuban, 1983; Mehan, 1989).

Applying a gender lens to computer use in schools we find that boys are more technologically motivated\textsuperscript{15} than girls. This pattern, although absent

\textsuperscript{15} I would like to see a number of additional factors included in this statement. For example, what we identify as motivation could elsewhere be described as aptitude, performance/ability, interest etc. Whatever guise is chosen to express these differences it simply means that girls have most likely not had the same opportunities and access as
from preschool through early elementary, appears sometime in the third and fourth grades (Chen, 1986; Schubert, 1986; Hattie and Fitzgerald, 1987; Jones, 1987; as referenced in Nelson and Watson, 1990-1991) and continues throughout their schooling becoming increasingly pronounced in high school (Chen, 1986; Jones, 1987; Feselter, 1985; Frey and Ruble, 1987 as cited in Nelson and Watson, 1990-1991). Young (1991) suggests that this differential pattern might be the result of the fragmentation of the curriculum into different disconnected traditions which know little about each other. Young's (1991) most compelling point is that "[t]he implicit message of this curricular separation of technology is that despite its inescapably human origins and consequences, it cannot be classified among humanities" (p.237-238). The social consequences of technology are veiled, separated from experience; the technology is objectified and reified situating it within the traditions of a masculine culture. One has to wonder if this observation might offer some insight as to why young women have not registered for courses which use the computer regularly\textsuperscript{16} in their programs.

There are obviously more coercive circumstances which contribute to young women selecting courses other than computer technology. For example, Acker and Oatley (1993) described the disturbing findings of a boy-centered computer culture from the work done in Canada by Carmichael, Burnett, Higginson, Moore and Pollard (1985). Girls in grade seven chose to complete other school work rather than doing the uninteresting challenge assignments created by the teacher. Too often, we accept plausible excuses because it is

\textsuperscript{16} Although I personally do not have the data to support my observations I have spoken with researchers who are currently observing in high schools and as a result of this communication I would have to counter the notion that computer use is more than likely not regular in courses other than Computer Studies. The computer is used as a word processing tool or typewriter in most instances in schools even though there are those who would tell you otherwise. Occasional use in courses other than computer studies is probably more the norm.
easier to deal with than the discomfort and inconvenience of asking questions and looking more closely. Acker and Oatley sought validation for the excuses, probed deeper and found, in their two year study, significant problems with the boys’ behaviour.

... Aggressive strategies, such as starting to print when it was a girl’s turn to use the keyboard, or telling the teacher if a girl’s disk was left around the classroom, so that it would be locked away for several days as punishment... There was no sharing of knowledge or materials between the sexes. Boys kept the key\textsuperscript{17} to the cupboard with the manuals, discouraged girls with scathing comments, and manipulated girls by ‘trading’ computers so that the girls ended up without a printer or a machine they did not know how to use. The teacher seemed helpless and did not devise remedies.( Acker and Oatley, 1993, pp. 258-259)

With the last sentence in this quotation the blame for this behaviour could easily be [mis]placed at the feet of the teacher. However, verification of similar behaviour has been found in other studies in Canada and the United States and are referenced\textsuperscript{18} in Acker and Oatley (1993). This behaviour is not unusual\textsuperscript{19} nor is it the fault of the teacher. Miller and Olson (1995) when describing their observations of “the battle of the mouse” make visible the role software can play in students’ relationships between the computer and each other. Due to the fact that only one reader’s needs could be met, children who previously worked well together began to squabble over the mouse with the stronger reader or the more dominant personality taking charge. In the teacher’s experience the children worked well together so this squabbling was overlooked (Miller and Olson, 1995, p.76). With the advent of cooperative

\textsuperscript{17} My emphasis, as this has been my experience in an adult environment.
\textsuperscript{18} (Hawkins, 1985; Schoenberger 1984; Silvern, Williamson & Countermine, 1988)
\textsuperscript{19} My emphasis.
\textsuperscript{20} This point will become even more emphatic when the relations of boys and girls in the classroom are discussed a little later in this paper.
learning in classrooms skirmishes are often part and parcel of peer interaction as students determine their roles in the group. Because bickering is common amongst children, it is atypical for adults and teachers to intervene.

The introduction of technology into classrooms has resulted in some practices which are not good pedagogy. A plausible example, suggested by Miller and Olson (1995), finds computer simulations being substituted for hands-on science experiments. They posit that students would begin to believe computer results over their own real world experiences with little value being attributed to an experiment carried out in real life. More compelling, is the authentic evidence, found by Mehan (1989), where students were left on their own to figure out what was expected of them at the computer, without direct adult supervision and instruction. Perhaps, the more insidious observation is the one where teachers attribute power and personality to the computer:

... we have seen fine teachers who regularly call all students together before lunch for sharing or story time tell children working at the computer to remain there. Those children reading books come to the circle, as do those who are writing or working at learning centers. Only the children working on the computer stay at their task. (DeJean et al., 1996 as referenced in Miller and Olson, 1995, pp. 75-76)

What is striking about these observations is that teachers are buying into the claim that computers can teach. More frightening is the fact that many otherwise competent teachers seem to accept this claim without question (Miller and Olson, 1995, p.76). It is the technology driving the teaching and learning wherein teachers succumb to the curriculum\footnote{Curriculum in this instance is provided by the software 'textbook'.} of the technology rather than modifying their teaching. Although there are teachers
who use software in imaginative ways, unquestioning adoption of software raises doubts around competence\textsuperscript{22}. There are often discrepancies between teachers' views of software, children's views of the same software, and students' preferences (DeJean et al., 1995, as referenced in Miller and Olson, 1995). More research and education are needed to assist teachers in making beneficial pedagogical choices.

There is little doubt, however, that teachers do play a critical role in shaping students' computer experiences in schools (Char, 1983; Char & Tally, 1985; Hawkins, Char, & Freeman, 1984; Hawkins & Sheingold, 1985; Mehan, 1985; Michaels, 1984; Riel, 1984; as referenced in Char and Hawkins, 1987, p. 211). The incorporation of computers into classrooms reflect the individual teachers' personal views as well as their interpretations of the pedagogical functions of the technology. This occurs across many computer applications.\textsuperscript{23} Another confounding issue is the interpretation of technology as social practice. There are those who assume technology causes changes in the social organization and those who believe the social organization determines technological use. Mehan confirms what has been stated previously in this paper that (the) social organization (of the classroom) and technology use are mutually influential; not a unidirectional relationship (Mehan, 1989, p. 4).

Much attention is directed toward student access to technology. The common hype speaks to the need for children to be in contact with computers so that they can participate in the information society. I believe the concern for access is legitimate, however, in this paper access takes into account

\textsuperscript{22} Apple and Jungck (1990) would emphasize the deskilling of teachers rather than [in]competence to this mix.

\textsuperscript{23} For example: word processors, simulations, databases, programming, and interactive videodiscs. "For instance, one teacher might use database software as an example of an example of a computer application in business, whereas, for another teacher, it might serve as a vehicle for encouraging students to think critically about concepts of information organization" (Char and Hawkins, 1987, p. 211).
issues around gender equity as earlier defined. Too often, access is assessed as a ratio, a number calculated by dividing the number of students by the number of computers. From this we know only the availability of the resources. What we do not assess is which groups of students are using the computers. Do they have access when others do not? Differential access is commonplace in the schools. The answers to the more telling questions are only obtainable through direct, impartial observation. What is happening during voluntary computer time? How are the computer labs scheduled? Which courses have priority? What do the students, themselves, have to tell us about how computers are perceived and utilized? The importance of these questions when assessing access to technology is confirmed in the following quote:

Access is one aspect of inequality and is predominantly determined by state funding levels and district or building policies. Equity and equality concerns in process are closer to classroom teaching and, thus, to the teachers' daily behavior. (Mehan, 1989, p. 8)

The evidence is overwhelming that equity has not been achieved. Boys continue to have more access to computers at home, at school and recreationally than girls. Parents are more likely to buy computers for their sons than their daughters. Boys are more likely to be sent to computer camps and attend after school computer clubs than girls (Acker and Oatley, 1993). Then, as costs and age increase, Miura & Hess (1983) found that the proportion of females decreases in computer related courses outside of schools (as referenced in Collis, 1991, p. 148).

The number of computers in schools does not change the fact that females make less use of the technology than do males. Females, by in large,

\[24\] In the form of arcade games.
do not register for advanced computer science courses at secondary school (Becker, 1987; Lockheed, 1985; Smith, 1985; Anderson, Klassen, Krohn & Smith-Cunnien, 1982; Lipkin & McCormick, 1985; Newsnotes, 1985a; as referenced in Collis, 1991, p. 147-148). Although scheduling and limited choice may be factors in junior secondary schools, the situation does not appear much different there (Hess & Miura, 1985; Revelle, Honey, Amsel, Schauble & Levine, 1984; as cited in Collis, 1991, p.148). “Teachers at all grade levels identify boys rather than girls, as the students most likely to be involved with school computer use” (Becker, 1987; as referenced in Collis, 1991, p.148). Is there any reason to be concerned about these differences in attitude or participation? Does it matter that young women do not see themselves working with computers and technology?

They believe that working with these machines is appropriate for bright males, but not for them, that they indeed are “not cut out for computers,” and that the efforts they might make would be repaid with rapid social embarrassment and personal frustration... Females expect they won't do well, won't enjoy the [computer] contact, and have no need for it (Collis, 1985b, pp. 180-81; as quoted in Collis, 1991, p.149)

I believe it does matter. Equity is impossible when two out of every three students currently learning about computers are boys; when better behaved students have more computer time than those who do not conform; when low-achieving students use computers for drill and practice; when photographs in computing magazines and textbooks include predominantly white males; and when children who are from minorities, poor, female, or low achieving are found to be further behind once computers are introduced into schools (Chambers & Clarke, 1987, as cited in Sutton, 1989; Sutton, 1989). Just in case there is some doubt about the relevance of these findings to the B.C. educational system, these inequalities have been found in the U.S.A.,
Great Britain, Australia, Canada, and New Zealand. Complexities associated with equity issues might be difficult to unravel but findings like those cited above are much too numerous and substantive to be ignored. With British Columbia's technology initiative and its mandate to introduce greater numbers of computers into schools, it would appear that the ethics of technology planning would require 'evidence' of discussion about how computers are used in schools juxtaposed with pertinent research.25

Reading Bryson's (1993) research report caused me some concern because teachers were found to be ill-prepared to handle the technical aspects of computing, as well as, the instructional aspects of using computers. In fact, they had a fundamental misunderstanding of what integrating computers into the curriculum entailed. This is especially evident with the example of "typing"26 stories into the computer being attributed as a component of Language Arts curriculum. Bryson concludes that:

> *new uses of technology cannot occur without remarkable dedication and extra effort on the part of the teacher. Further, new users of technology need far more support, guidance, and training than has been acknowledged in the past.*27 For, without basic technical and curricular preparation, computers will continue to be 'just another activity centre" ... (Bryson and Robitaille, 1993, p.97)

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25 For me, one of the most glaring omissions from all but a very few of the district plans was the total lack of evidence that policy makers had acquired a knowledge base gained from reading research in the technology area. Rather, the myth information of hype is the resource of choice.

26 This choice of words is apt because typing is indeed how most students use the computer. Class time on the computer is limited to perhaps two periods a week leaving little if no time for composing text on the computer. Text is composed in the classroom and computer time is used to type an already composed story for publication.

27 I have emphasized this conclusion for a number of reasons. First, it is substantiated in the literature and second because this comprehensive report contracted by the Ministry of Education has not been distributed by them. The motivation of the suppression of this information [authentic evidence by recognized educational researchers] brings into question what is important. Is the technology for political gain important? What about the equitable distribution and use of the technology for social and cultural benefits for our students? You be the judge.
In the foregoing section I have summarized research that characterizes how new technology is implemented in schools. The issues raised are substantive. Yet technology plans typically have few if any references to the socio-cultural complications associated with attempts to change technology use in schools. The section which follows considers the concept of inequity to examine how sexism operates in schools.

Who are the Experts?

The following quotation has been extracted from the Bryson's (1993) study where the interviewees were asked questions about expertise and gender.

"I personally never think of issues in terms of dominance by gender...It just seems to me that gender equity and gender issues are non-issues in at least most elementary schools if for no other reason than the majority of the staff...The male is the minority figure in most elementary schools. When we as a staff sit down to discuss anything the gender issue doesn't come up. Most of our staff are female. The person who comes in from the Board to fix the computers is male, but I don't see any connection between expertise and maleness simply because that person happens to be a male. If anyone attributed any significance to that male figure being responsible and the expert I would be really surprised. I may
be really naive too." (m/ p) (Bryson, 1993, p.139)

Within the educational setting it is highly unlikely that the relationship between expertise and gender is considered when discussing, let alone planning, for technology. Without a doubt, the implementation of new technologies generates a complex mixture of enthusiasm and frustration as well as creating a demand for technical expertise. Yet, to even hint that the effects of gender stereotyping would factor into a discussion of technical give rise to some rather turgid disagreement. Bryson (1993) in her study of new technologies and the Primary Program, reports that female students and female staff members appeared less likely to be identified as "computer experts". The implications of this relatively banal observation are anything but innocuous. Discrimination knows many disguises and if left untended with "respect to the implementation of new technologies, possibilities for inequitable outcomes invariably pose a great risk because, historically, this site of social transformation has proven to be a domain where inequities are both pervasive and resistant..."(Bryson, 1993, p.139). Inequity will continue to manifest itself through limited access and unskilled use by female students with a similar absence of access and skill by female teacher role models. Hawkins (1987) reported that teachers specified differential interest and achievement when identifying only boys as being the most skilled members of the class.

The prerequisite of "skill" or "expertise" in users of new information technologies is often used as an effective filter and as a substitute for gender to deny entry into the technology enclave. In fact, the concept of skill in any domain is much more than a simple matter of learning how to perform a

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28 The 'm/P' refers to a male principal on of the interviewees in the Bryson (1993) study.
30 In this paper the domain focuses upon technology. Bereiter and Scardemalia, 1993, whom
task proficiently. Wajcman (1991) argues that the status of "skilled" has everything to do with masculinity and femininity:

What role does technology play in the construction and reproduction of these gender relations, and in their potential transformation? ...As technologies develop and displace each other, there is a disturbance among the technically skilled strata. Some gain and some lose....But technology is not an independent force; the way in which it affects the nature of work is conditioned by existing relationships. There are conflicts and negotiations over technological change and opportunities for changing the sexual division of labour to women's advantage are often foreclosed by male power. (p. 34)

Definitions of 'skill', 'expertise' or 'knowledge' "have more to do with ideological and social constructions than with technical competencies which are possessed by men and not by women" (O'Riley, 1991, p.37). Although Bereiter and Scardamalia's (1993) work, Surpassing Ourselves: An Inquiry into the Nature and Implications of Expertise, does not consider the gendered nature of technological expertise they do acknowledge the social influence knowledge on expertise. Nevertheless, the acknowledgment of a "skills"[skilled] social component leads me to believe that they, too, might agree with Wajcman.

Knowledge is not just one more factor to be added in with personality, aptitude and social factors to account for expertise. These other factors also enter into explaining how the knowledge was acquired. Thus the knowledge is part of the expertise ---a large part of what must be explained --- and not something that lies in the background as part of a pattern of causes. (Bereiter and Scardamalia, 1993, p.44)

I quote later, attach their definition of skill / expertise to any human endeavor.
What, indeed, counts as skills and who has these skills? Michael Apple and others have suggested that computers will de-skill the occupation of teaching and if history is any indicator this de-skilling will likely affect women teachers more than men teachers. A female teacher's words tactfully emphasize this point:

I think this is a really unfair thing to say, but it's almost like...if you know too much then who's the computer expert in the building? It's almost like we're trying...like we're being controlled in how much we learn and how much we cannot learn because then who's the expert. Which is really unfortunate... The CC would rather do it for you than to teach you how, and I'm going, "but I want to know how, I don't want you to do it for me", and the CC says, "No, there's no time...It's done." So I said to the CC, "I would like to learn how to do a spreadsheet". "No time!" So I still don't know. If I could have done a spreadsheet in the learner profile program this year I would have used it. (Bryson, 1993, p. 36)

Bryson (1993) reports that once female coordinators' began to feel comfortable with the technology their in-school time allotment for this work was reduced though this was not necessarily the case with male computer coordinators. Bryson (1993) calls our attention to a well-recognized pattern in the gendering of new technologies:

In relation to the gendered nature of teachers' and coordinators' work, it is particularly important to pay attention to the probability that once female staff begin to make inroads here, that the likelihood is great that the work itself will be downgraded with respect to the provision of material supports and/or prestige or formal kinds of institutional recognition. This is a well documented pattern observed in relation to the implementation of new technologies and the gendering and regendering of a wide range of uses of new technologies (see Hacker, 1991; Marvin, 1988; Rothschild, 1979). (p.138)

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CC is the computer coordinator.
Similar cautions have been raised in the literature concerning women and technology (Benston, 1983, 1993; Cockburn, 1993; Perry & Gruber, 1990; Smythe, 1987). The introduction of new technologies into the schools affects women teachers differently than men. Apple and Juncgk (1990) argue that the relationship between teaching and the control of one's work ought to be examined in terms of the struggles that occur over "what counts as [a] skill and who has skills" (p. 229).

Time, is a commodity that is precious in schools (Werner, 1988), and it takes an extensive amount of time to become a "computer expert". This is time that a woman teacher likely does not have at her disposal for a number of reasons. Patriarchal relations still dominate many families with childcare, eldercare and household responsibilities falling under the purview of the woman. If single parent families were also added to this equation we can surmise that women with these responsibilities have less time to take additional course work, attend after school/evening/weekend workshops and spend the time at home "learning" the computer. In all likelihood, the impact of this can be striking.

As Apple (1987) noted that when teachers do not have "the time and the skill to do their own curriculum planning and deliberation, they become isolated executors of [canned programs, integrated learning systems and] someone else's plans, procedures, and evaluative mechanisms resulting in the separation of conception from execution (p. 237). This separation of knowledge from experience is enhanced by discrete prepackaging of teacher proof units or identified domain "experts". The reliance on prepackaged

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32 I in no way wish to imply that there are not male teachers who might also have these types of responsibilities but I believe the numbers would illustrate that this situation is uncommon for men and very common to women.
33 These are my additions. They are the very things that lead to a lack of control over one's working environment and lead to the deskilling of teachers.
canned units or identified "experts" can have a number of long term effects including a decided loss of important skills and dispositions on the part of teachers. Franklin (1990) suggests that our personal, vernacular reality consisting of immediate, private and personal experiences is replaced by extended reality. The problem with extended reality is that it is an imposed reality. A reality which is acquired from others' experiences and artifacts. These imposed realities become so much a part of our behaviour and experience that we come to believe that they are real. Thus we are confronted with "experts" defining who we are, what we believe and how we ought to live and teach. Why is this important in the context I am writing about? I answer this question with the words of Ursula Franklin (1990):

I dwell on this because the downgrading of experience and the glorification of expertise is a very significant feature of the real world of technology. Sometimes it is important to stress that because the scientific method separates knowledge from experience it may be necessary in the case of discrepancies to question the scientific results or the expert opinion rather than to question and discount the experience. It should be experience that leads to a modification of knowledge, rather than abstract knowledge forcing experience as being unreal or wrong. (p.40)

"Expertise" has benefits. With the introduction of new and likely gendered technologies the benefits will fall to the few well chosen and likely male teachers and their male students. They will likely be given time at work as well as at home to hone their expertise. The glorification of this technical expertise will benefit their careers. Meanwhile, the patterns being laid down in the practice of these new technologies will become an accepted part of the school's culture. These patterns will reflect the continuation of

34 The experience of ordinary people.
35 See data in Chapter 3.
older patterns in society and the school. How [in]visible will the women and girls be?

Expertise, at the outset, appeared an inoffensive and naive concept to introduce into this literature review. I contend the question that I began this section with is a robust one for women teachers and female students especially in light of the introduction of new technologies into education and in light of planning for equitable opportunities for all students to benefit. Expertise is teachable and it can be taught to enhance women's and girls' positions in the face of technological change or it can be discounted. Is anyone listening for these quietly spoken words?

I think this is a really unfair thing to say, but it's almost like...if you know too much then who's the computer expert in the building? It's almost like we're trying...like we're being controlled in how much we learn and how much we cannot learn because then who's the expert. Which is really unfortunate... (as quoted from Bryson, 1993, p. 36)
CHAPTER THREE: THE TEXTS AND POLICIES OF APARTHEID IN TECHNOLOGY

But there were many more influences than anger tugging at her imagination and deflecting it from its path. Ignorance, for instance. The portrait of Rochester is drawn in the dark. We feel the influence of fear in it; just as we constantly feel an acidity which is the result of oppression, a buried suffering smoldering beneath her passion, a rancour which contracts those books, splendid as they are, with a spasm of pain. (Woolf, 1929, p. 80)

She Altered Her Values

The title of this thesis, Who Has the Key? Accessing the Technology Citadel, describes the all too familiar feeling of isolation that has been a constant, as I solicit membership in the technology fortress. Being on the periphery watching, listening, and deferring, I silently assess those who hold the secret knowledge; the power; and retain the key.

The words given voice inside the mind are not always clear, However; they can be gentle and elliptical, what the prophets called the bat qol, the daughter of the voice of God, she who speaks in whispers and half seen images... a sort of passive seeing that enables the eye, in a dim light or at a great distance, to grasp details with greater clarity by focusing slightly to one side of the object of interest. When active, strained vision only obscures and frustrates looking away often permits the eye to see and interpret the shapes of what it sees. Thus does inattention allow the mind to register the still, small whisper of the daughter of the voice. (King, 1994, pp. 346-7)

I look, I listen and I interpret for the better part of three years until I am finally galvanized by resentment. It is the last day of a grueling three-day

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1 Woolf writing of Charlotte Brontë's Jane Eyre.
institute on Technology Planning and I sit in a room in an audience where I know no one by face or name. I am listening to a speaker, watching the demonstration of an electronic science magazine in its pilot stage. What potential! What excitement! An interactive, public venue to showcase student work. How easily I am seduced by the romanticized possibilities of this technology. The first example: one young man had crafted a short animation of a cat jumping. We see the cat jump. Another example: another young man has drawn a model of ship and included a line drawing of a wave hitting this sailing ship from some past forgotten time. Physics explained. This is the substance of science! I am captivated. The speaker continues by mentioning, in passing, a project done by two young women on the effect of chlorine on different fabrics. I notice a slight twitch from the presenter. The presenter moves quickly along... to another section of the magazine... I was stunned and I was silent.

“She had altered her values in deference to the opinion of others.” (Woolf, 1929, p. 81)²

Why was I silent? Why was there no demonstration of how these young women collated and presented their information? Why was there no acknowledgment of the chemistry, economics and applied mathematics these young women were learning as they searched for a longer lasting and more economical bathing suit fabric. Why was this not worth the click of a mouse? Why was there no mention of their interest in solving a problem that was affecting them in their everyday lives? This, too, was not worth the click of a mouse. The speaker had authority, reputation, position and knowledge. These, I did not have. I looked around me hoping to confirm my uneasy feeling

² In this particular case that “she” is I. To this day, I still feel the embarrassment and disdain for not having spoken out on behalf of those young women.
in the eyes of another woman. The room was dark. I was silent. For those young women, I carry with me the memory of a gendered, technological apartheid. Echoing Woolf's sentiments, in *A Room of One's Own*, Dorothy Smith's words convey the reason for the uneasiness that overwhelmed and silenced me in that dark room...

Men attend to and treat as significant only what men say. The circle of men whose writing and talk was significant to each other extends backwards in time as far as our records reach. What men were doing was relevant to men, was written by men about men for men. Men listened and listen only to what one man says to another. A tradition is formed in this discourse of the past with the present. The themes, problematics, assumptions, metaphors, and images are formed as the circle of those present draws upon the work of the past. From this circle women have been to a large extent excluded. They have been admitted to it only by special license and as individuals, not as representatives of their sex. They can share in it only by receiving its terms and relevances and these are the terms and relevances of a discourse among men. (Dorothy Smith in Gaskell and McLaren, 1991, pp.241-242)

I cannot allow reason to serve to excuse my silence once the illusion has been revealed, the whisper heard, and the daughter understood. I am both curious and suspicious. I must make visible my concerns. "To be suspicious is good. To allow it to silence one is something else. Sorting the oppressor from the oppressed has never been easy once we recognize the complexities of power that result from differences in race, class, and gender" (Wolf, 1992, pp.122 - 23). I believe I must act and heed the cause of feminism as expressed in the following quote from *Claiming an Education*.

For feminism means inserting the concerns of women from all walks of life into policy and practice, ultimately reshaping the whole so that it better serves both men and women. It is linked with the struggle to redress other inequalities, both as a matter of theory - because the persistence of one kind of inequality affects all forms of inequality; and as a matter of
practice - because we need a coalition of all those who oppose that inequality. Examining the ways that social class, race, and culture are all gendered experiences helps us understand those issues. Examining the ways that differences among women are based in systematic inequalities of other kinds helps us understand the organization of women's experiences. (Gaskell, McLaren and Novogrotsky, 1989, p.3)

And so I arrive at a place where my curiosity about publicly expressed policies and seemingly “discreet” practices engendered by technology goad me to use the opportunity of a thesis to investigate a possible relationship between policy, power, gender and technology. The district plans, required by the Ministry of Education, for obtaining technology dollars in the service of education serve as a divining rod for what I see developing (and developed) around me. I feel encumbered by the restraints of my location. Nevertheless, I begin the search for a methodology with which I can work.

Finding a Research Methodology

What genius, what integrity it must have required in face of all that criticism, in the midst of that purely patriarchal society, to hold fast to the thing as they saw it without shrinking. Only Jane Austen did it and Emily Brontë ... They wrote as women, write, not as men write. (Woolf, 1929, p. 81-82)

I went to MacMillan and Schumacher (1988) to seek advisement on qualitative, ethnographic research. I found that ethnography is interactive, requiring extensive time in the field to observe, record and interview. Realities are to be socially constructed through individual and collective definitions of the situation. The purpose of research is to understand social phenomena from the participants’ viewpoint. Process and methods are flexible and emergent. The multiple realities are so complex that a priori

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3 I am the participant. and I am not interested in the view's of those who wrote the technology plans. I believe that truth is buried behind the committee walls.
decisions are uncommon. Immersion, disciplined subjectivity, self-examination, combined with criticism of the quality of the data and the problems encountered craft the art and science of the research.

This explanation appeared too intensive for a single person with expired time lines. So, I looked to Van Maanen’s (1988) Tales of the Field or Wolf’s (1992) A Thrice Told Tale for advice. I was uncomfortable with the ‘genres’ of fiction, the realist, the confessional and impressionist tales. As I have stated earlier I work in a public place and my “community of practice” is too small for anonymity. Individuals would be too easily identifiable either with or without pseudonyms. The decision was made that anecdotal records, journal writings and interviews were not techniques I wished to perfect for this thesis.

I have three very strong reasons for not going this route. One rests at the door of the academy. As a part-time student I came to see that I was not situated within the power, knowledge or money environs. I had no insider, no advisor, no mentor, to apprentice me in grant applications which might have lead to partial sponsorship or work as an intern researcher; both of which would have enhanced my understanding of research methodology. For too long my interests knew no champion. 4 The second reason for pursuing a methodology which essentially retains my anonymity is more complicated. It has to do with my topic and my location. Until I gain some modicum of proficiency in the technological bastion of male expertise I am unwilling to jeopardize my token admission “by special license as an individual”. My third reason is essentially captured in the titles of Dorothy Smith’s two books: The Conceptual Practices of Power and Texts, Facts, and Femininity:

4 This particular statement speaks of a time previous to when I met (and I might add serendipitously) my current advisors who offered to help me despite the fact that they already had a full complement of graduate students and an already full agenda with research and committee commitments.
Exploring the Relations of Ruling. I am interested in the policies of power. Power as found in government policies and discourse; power as evidenced in district technology plans; and finally, an exploration of power through my personal relationships (or lack thereof) to the powerful. Obviously, this last interest is not the subject of examination in this thesis.

As I continue to search for a research methodology I strongly resist single focused descriptive quantitative statistical designs\(^5\) that fail to talk to people, examine their contexts and conscientiously report their research design and selection features.\(^6\) McMillan and Schumacher (1989) describe quantitative procedures as representing "parsimonious ways to summarize and organize information that has been collected."\(^7\)(p.208) An association with the "miserly" in reporting the results of research leaves me somewhat perturbed especially when I consider my desire to pursue something meaningful. In the same section of their book, McMillan and Schumacher (1989) proceed to list important reasons why educators ought to gain a functional command of the principles of statistical procedures:

1. To understand and critique professional articles (for example, were appropriate statistical tools used?).
2. To improve evaluation of student learning.
3. To conduct, even in modest and informal ways, research studies (for example, how should the results be analyzed?)
4. To understand evaluations of programs, personnel, and policies.
5. To help become better equipped as a citizen and consumer, making decisions based on quantitative data or arguments.
6. To upgrade the education profession by providing standard skills to communicate, debate, and discuss research that has implications for educational practice. \(^7\)(p.209)

\(^5\) In this context I am referring to those studies which report on single interventions in complex educational settings. An example of sorts would be that reading program A is better than reading program B.

\(^6\) I refer here to a specific example: the 1995 Provincial Technology Survey published under the auspices of the Ministry of Education in the Province of British Columbia. (This document is available online at URL: http://www.etc.bc.ca/provdocs/pacet/techsurvey.html) I choose this example because it contains information relevant to this thesis.
I see no reason to take issue with these "important reasons" when I reflect on the ethics of their intent. In fact I would hope that the results of my research would instigate change in how educational technology plans and policies are derived, discussed and evaluated in the future. I intend to use some public numbers to describe, albeit partially, the location of the technology initiative in the school districts of British Columbia. These numbers will serve as my acknowledgment to the merits of quantitative research.

My preference remains with qualitative inquiry because it is "guided by epistemological principles, socially constructed values, inquiry focuses, and findings emerging through analytic methodologies such as constant comparison... [while] illuminating the inherent paradoxes of structure and freedom (Oldfather & West, 1994, p.22). It is in the following words that I begin to sense that I have a place as a researcher. It is said that "qualitative methodologies often suit researchers who hold a political agenda or ideology that values inclusivity" [and] ... "attempt to understand and represent multiple constructions of experience" (Oldfather & West, 1994, p.24). This thesis represents such an agenda.

As an educator working with technology and inspired by the principles of gender equity, I wish to discard the veil and expose those policies and practices which preserve the status quo and exclude others through the inequitable distribution of power, knowledge and resources. As I have stated earlier, the subject is gender but the practices, conceptual and relational, are manifestations of power, elusive technological imperialism. Technology is much more than a tool, a system or knowledge. Technology represents the
“economic, social and political choices” embedded in its design, selection and distribution. “Technological change is a process subject to struggles for control by different groups. As such, the outcomes depend primarily on the distribution of power and resources within society.” (Wacjman, 1991, p. 23)

The Ministry of Education, school districts, schools, teachers, and students are members of a community where choices are being made whereby some will gain and some will lose. My aspiration is to see the policy makers and practitioners make informed and equitable choices as they introduce and use new technologies.

All Language is Essentially Social and Political

That language is our tool to explore reality has application in all research. There is no Archimedean point outside language and culture from which the researcher can study reality. (Nielsen, 1995, p.4)

‘Each word’, Bakhtin says, tastes of the context and contexts in which it has lived its socially charged life, and, each word is a little arena for the clash of and the crisscrossing of differently oriented social accents says Bakhtin; ‘a word in the mouth of a particular individual is a product of the living interaction of social forces’. Language is here simply defined as the way in which human beings make meaning, as well as the worldviews which have been socially constructed in that process, while politics are understood as relationships between groups with different worldviews, and the processes by which they contest each others’ perspectives. And these contestations are not limited to the verbal level; my definitions assume that words and deeds, policy and practice, are also inseparably linked. (Casey, 1993, n.p.)

In qualitative research, tools, data material and results are recorded as texts having linguistic form and are shaped by more than the language

7 David Noble, 1984, as cited in Wacjman, 1991, p.22-23)
8 This view will be developed in some detail in the next section using the work of Dorothy Smith.
system. There are "larger signifying structures that belong to the level of language use". Text has identifiable patterns with deictic constructions of time, space, concepts as well as a narrator's perspective. To be understood its uniqueness must have a generic identity. The understandings which are generated from the generic identity of the text permit the possibility of social and political analysis. This is why I believe that the texts of the district technology plans are suitable material to examine when considering a social and political analysis of technology policy. Lyon (1991) extends the notion of policy to many "different levels, from international forums, through national government planning, to the level of the firm and the school, and even the neighbourhood organization" (p. 106). His comment about "what currently passes as policy" frequently lacking "ethical dimension[s] and social awareness" (p. 106) has direct implications to the intended course of my forthcoming analysis as this is an, as yet, unsubstantiated claim.

I offer a slight paraphrasing of Lyon's commentary of today's political climate in light if the Ministry of Education's requirement of a technology plan to precede their release of the technology funding grants. Technology funding money is available for those willing to adopt new technologies without questioning social goals; without exploring the possibilities of emancipatory, appropriate technology; and without examining the ethics or cultural dimensions of new or "old" technology. These are not perceived to be priorities.

9 Nielsen, 1995, p. 4.
10 Nielsen, 1995, p. 4.
12 This will be pursued in greater depth in the next section of this chapter.
13 Original text: Within today's political climate, overshadowed as it is by technology policy (whether economically competitive or militarily secure), strenuous attempts are made to co-opt social science for technological ends. Research money is available for those willing to investigate the conditions under which new technology may be adopted, and people adapted to it, successfully. To question social goals, to explore the possibilities of emancipatory, appropriate technology, to examine the ethics or cultural dimensions of new technology, these are not perceived to be priorities. (Lyon, 1991, p. 106)
Because all research is socially located and value laden, there is no text without a subject speaking; one who speaks in a particular voice, reflecting particular values and assumptions (Gaskell and McLaren, 1991, p.12). My task is to identify the subject of those voices, their values and their assumptions. David Lyon signifies the importance of this type of inquiry in the following quote:

The task ahead involves a reassertion of the classic role of social inquiry, which is to act as a form of 'public philosophy'. Social analysis has unavoidable moral dimensions, and is concerned in profound ways with the 'human condition'. This is why issues of the magnitudes of the social shaping and social consequences of Information Technology may not be siphoned off into mere social engineering. Social scientists dare not sell their moral and analytical birthright for a mess of technological potage. Social analysis must remain in, but not of, the 'information society'. (Lyon, 1991, p.106-108)

Public Data: Quantifiable and Qualitative

I am particularly intrigued by the posting of School District Technology Plans on the World Wide Web. If my teaching memory serves me correctly, this is the first time that there has been convenient, open access to documents produced by local school districts and the Ministry of Education, Skills and Training distributed to the general public, let alone a global community. This unusual opportunity provided me with the majority of the documentation I required to construct a research project. Those districts whose plans were not available on the World Wide Web were contacted by me through a personal letter. Seven districts responded to my personal request. I decided

14 These plans are available at URL: http://www.etc.bc.ca/provdocs/
15 School District #9, (Nelson); School District #12 (Grand Forks); School District #15 (Penticton) now School District #67 (Okanagan Skaha); School District #39 (Vancouver); School District #57 (Prince George); School District #62 (Sooke); and School District #81 (Fort
not to follow up on the others because I had 60 out of 74 district plans. I believe this to be a substantive, representational data source from which to work. A second source of data was obtained from Crown Publications Incorporated. Statistical data reports are available to the public for a nominal cost. These data from these reports are from the British Columbia School Finance and Data Management Department. The numbers in these reports are used to illustrate my suspicions of gendered working and learning environments in the places where the technology plans will be enacted. The third and final set of data were obtained from several recent Ministry of Education, Skills, and Training publications: The Recommendations of the Provincial Advisory Committee on Education Technology (PACET)’s Provincial Information and Computer Technology Plan; Putting Policies into Practice Implementation Guide (August 1994), The Kindergarten to Grade 12 Education Plan (September 1994), and the Technology in British Columbia Public Schools: Report and Action Plan 1995 to 2000. These items serve as background to the current Technology Planning initiative and feature quantifiable data as well as ‘reports’ which serve as

Nelson).

16 My cost was just over $80.00. I did not use every report I ordered as some were purchased out of curiosity.
18 In the last few years there has been three name changes affecting the Provincial Ministry of Education so items that are published under the Ministry of Education name are also included.
19 I believe it should be again emphasized that there is a substantial grant or funding
Taking The Texts Seriously

Before proceeding with the analysis of the district technology plans, it seems important to reiterate the constructs with which the analysis is represented. Rather than falling into the objectified form of constituting knowledge, I write as a woman attempting to discover and to critique the sociocultural structures and practices from a specific location without allowing myself to be swallowed up into the wholly subjective. Inquiry, from the standpoint of women, has no specific content because the inquirer begins from how it is for this woman, in the site of her bodily existence and in the local actualities of her working world. In making "the everyday world problematic" the organization of localized practices of our everyday worlds become problematized (Smith, 1990a, p.28). The provincial texts and the district technology plans constitute a variety of experiences and unconditional datum. My interpretations of these texts may or may not be precise replications of the sociocultural practices, actions and behaviours ascribed to specific individuals. Nevertheless, by problematizing the texts of localized technology practices, the sculpting of "concrete conditions" is made visible (Smith, 1990a, p.25). An understanding of this experienced world cannot be achieved by remaining within its ordinary boundaries of assumption and knowledge. An examination of how knowledge in that world is mediated and how that world was organized prior to my participation in it as a researcher is required (Smith, 1990a, pp.25-26).

associated with this initiative.

20 The "concrete conditions".
People's experiences and discourse are transformed into "synthetic objects" which reveal the organization of actual practices. The texts\textsuperscript{21} themselves are indeed, part of the society and the social relations which are transformed. Our "knowledge" of contemporary society is largely mediated by texts\textsuperscript{22} of various kinds resulting in "an objectified world-in-common vested in texts, coordinat[ing] the acts, decisions, policies, and plans of actual subjects as the acts, decisions, policies and plans of large-scale organizations" (Smith, 1990a, p.61). Therein the emphasis shifts "from the situated imperfections of the knower to the status of knowledge as socially and materially organized, as produced by individuals in actual settings, and as organized by and organizing definite social relations. The social organization and accomplishment of the knowledge itself is the focus of inquiry"\textsuperscript{23} (Smith, 1990a, p.62). The texts (of the technology plans) are integral to the objectified organization of ruling relations inherent in their construction. They are the textual reality of the ongoing coordinated practices of actual people whose ideas, concepts, beliefs, and so on are expressions of actual social practices, as things that are spoken, written, heard, or read in definite local historical contexts\textsuperscript{24} (Smith, 1990a, p.62).

\textsuperscript{21} The district technology plans are the texts of objectified knowledge. "Objectified forms of knowledge, integral to the organization of ruling, claim authority as socially accomplished effects or products, [which are] independent of their making." (Smith, 1990a, p.61)

\textsuperscript{22} The meaning of texts is expanded to include all known forms of communication media (e.g.speech, conversation, film, radio, newspapers, documents, CD-ROMs, etc.). In this thesis I am referring to public documents in their written and electronic formats.

\textsuperscript{23} My emphasis.

\textsuperscript{24} In Smith's text she footnotes this particular idea as follows: "Though the social organization producing a factual account is isolated in this analysis, this has only accidental similarity to Louis Althusser's notion of scientific knowledge of a society as a process of production in its own right." (Smith, 1990a, p.212)
A simplification of Smith's explanation of textual reality embeds the facticity of the textual statements into two sequences, distinctive of socially organized processes: the social organization of the production of the account and the social organization of its reading and interpretation (Smith, 1990a, p.71). The ensuing diagram is illustrative of Smith’s conception of textual reality. I have included an abbreviated explanation in order to prepare for the analysis of the district technology plans.

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25 All of my material and quotations, with the exception of my commentary and references to the district technology plans, is derived from Dorothy Smith's *The Conceptual Practices of Power: A Feminist Sociology of Knowledge*. (Smith, 1990a, pp.71-80)

26 The property of being factual. (Smith, 1990b, p.10) As the findings of a piece of research [or in the case of technology the publicly accepted rhetoric] become taken for granted, they are finally incorporated into the texts of the discourse without reference to their source. Factual conventions of writing present the statement without the modifier that locates it in a particular subjectivity; to qualify a statement with the modifier “I know” is to deprive it of factual status. Achieving facticity obliterates the historical and specific source; the work, the local setting, and the authorship of [the] particular … are forgotten. Within the text, the reader finds what is presented thus as a given. (Smith, 1990a, p.66) Although a fact may be restricted in its circulation to a specific group or status, it is the same on each occasion of its telling or reading, no matter who hears or reads it- which is, of course, the grounds for restricting in some cases who it may reach. (Smith, 1990a, p.69)
Figure 3.1 is in error, ontologically and epistemologically, because lived (or "living") actuality encompasses the totality of the processes encapsulated in the diagram. "Lived actuality" is the point at which engagement becomes reflective; the point of entry into the textual. There is no event, no "what actually happened/what is," prior to the moment when the observer / researcher embarks on producing an account or a report. The socially organized practices producing the account stand between the point of entry, a variety of drafts, its fixing in textual time and the reading of the factual account. "What actually happened/what is' is not, of course, the equivalent of the 'lived actuality'; it is rather the virtual reality intended and organized by the text of the factual account." Integral and essential to the status of the account is the establishment of methodical, independent, and referential procedures. Statements of what actually happened or what is actually the case must be formulated so that they are independent of the perceptions and perspectives of particular individuals. Because context, practices and
procedures differ, a given institution or organization develops a specific form which it enforces to confirm the statements as true and factual, sanctioning the reader to read the account as such. Inscriptive practices involve techniques and technologies of keeping records, asking questions, taking notes, and so forth. In social scientific and administrative contexts, questions, categories or codes are established to manage the data for observation and recording which in turn structures the account in definite ways. Although these methods of inscription are not treated as features of the textual reality their effects remain once an account has been admitted. The traces of references to evidence, research, researchers, the technical processes involved, and so forth, drop away. The “texts” of the discourse become invisible and the text for “public” consumption becomes a stabilized virtual reality. This final version of the factual account prevails and is illustrative of the forms of organizational consciousness and dependent on contemporary bureaucratic and professional practices. Smith explains how one can come to see through the factual account:

“Reading through” the factual account to a “what is” or “what actually happened” means that the structure, syntax, and conceptual organization of the account is read into the “what actually happened/what is” it evokes. Hence concepts organizing the inscriptive procedure are transposed, via the account, into the representation of what is out there beyond it, the “what actually happened/what is” that arises at the moment of reading... Methods of reading factually are distinctive... “reading through” the account to the actuality beyond it; it is always supposed that there is more to be known than the account contains and that the account can (in principle at least) be checked against the actuality to which it refers. (Smith, 1990a, p.76)

The analysis to follow is my reading of the social organization of facticity as it is represented in the plans. Illustrative of the academic form of the researcher, the creation of my own account / text includes the references to
evidence”, “research”, “researchers”, and the technical process involved. It is my belief that such an identification process ought to be common everyday practice in education. Personally, I am extremely uncomfortable with the “power” of alienated knowledge and the placid acceptance of disembodied rhetoric. As Smith explains:

"power" is always a mobilization of people's concerted activities. If facticity, if objective knowledge, is a form of power, it arises in the distinctive concerting of people's activities that breaks knowledge from the active experiencing of subjects and from the dialogic of activity or talk that brings before us a known-in-common object. Objectified knowledge stands as a product of an institutional order mediated by texts; what it knows can be known in no other way... Objectified knowledge, as we engage with it, subdues, discounts, and disqualifies our various interests, perspectives, angles, and experience, and what we might have to say speaking from them. (Smith, 1990a, p.80)

The essence of Smith's conception of textual reality supports my contention that the societal institution of education is not a neutral context for dialogue. The institution has been and is “organized to define, demonstrate, and enforce the legitimacy and authority of linguistic strategies used by [a]... group—while denying the powers of others” (Leonardo, 1991, p.188). Any divergence from the dominant ideology of the institution is either “unheard”, “devalued” or “suppressed”. The purpose of the textual analysis of the technology is to make visible the gendered “power” relations that define the prevailing knowledge and practices of technology. By identifying what has been included as well as what has been omitted the notion of value-neutral technology may unmask the power and interests of the few who control the technology and hopefully will lead to a more equitable society.

The following two quotations also support a careful “reading” of the district technology texts uncovering the values of those who have power over the technology in the schools because it is they who will likely determine who
benefits and who looses. In any case, these plans are indeed serious texts. They represent the "values" traded to obtain the capital "offered" by the Ministry.

Knowledge is always inescapably complicit with the first-order myths and enabling fictions that underwrite its claim to truth. (Norris, 1985 as quoted in Bryson & De Castell, 1994, p.207)

Language can conceal and obfuscate, texts can be seen to 'universalize the particular and the idiosyncratic, privilege the ethnocentric, conflate truth with those prejudices that advantage the knower'. (Hawkesworth, 1990, pp.145-6, as quoted from Gaskell, 1992, p.135)

The Location of the Technology Initiative

The title of this section, The Location of the Technology Initiative, serves several purposes. First, I must reiterate that my everyday work is centered in the very technology initiative that I am about to describe. Therefore my data has been collected "from an insider's knowledge of the social organization" and as a result of participating in "the actual practices that bring the actualities of society into being" (Smith, 1990b, p.2).

Furthermore, the "location" my everyday practices, observations, experiences and involvements have provided me with the opportunity to explore the actualities of the power relations of the ruling apparatuses27 from the perspective of a woman on the inside of this "location". The feminist work of Dorothy Smith (1990b) on the relations of ruling and Bryson and De Castell (1994) on the pragmatic "true stories" of educational computing28 serves as

27 "The ruling apparatuses are those institutions of administration, management, and professional authority, and of intellectual and cultural discourses, which organize, regulate, lead and direct, contemporary capitalist societies." (Smith, 1990b, p.2)
28 "For the discursive context of research and practice in relation to educational computing is one in which sense is doggedly (even if often contra-factually) made, in which seamless narratives attempt to tell true stories of how and why new technologies are to be harnessed
the conceptual "location" for the two sections which follow. Secondly, I use the term "location" to identify the socially organized and organizing practices of place, time, concepts, ideology, knowledge, and ideas as expressed in the public texts that are my data. The "location" of the texts are described by Smith as follows:

... they are taken as occurring/accomplishing in time and as part of specific local historical processes... [Investigations of texts do not constitute them as a realm of meaning separated from the world they are written and read in. Rather, texts are taken up as constituents of ongoing social relations into which our own practices of reading enter us. (Smith, 1990b, p.11)

Bryson and DeCastell use narrative critique to structure their discourse on technology and educational computing to expose "theoretically opaque and deterministic account[s]" of the "influence" and "effects" of computers in schools. In my role as a researcher, Bryson and De Castell lead me to realize that the narrative I create is as a result of "an ongoing dialogical process of co-construction... constitute[d] [and constrained] by, necessarily partial and "interested" accounts" generated as a result of my "location" as a student researcher in the academy, as a direct participant in the initiative, and as a worker resident in the educational community.

Before I provide the background to the technology planning initiative a
stronger case should be made as to the premise that the texts about to be cited are representative of the social relations of public textual discourses. The textual analysis of public policy and public texts/accounts is representative of a body of work that is relatively recent in sociological investigation. Smith's work is unusual in that it views public texts "as organizing a course of concerted social action... an operative part of a social relation... activated... by the reader...[however] its structuring effect is its own." (Smith, 1990b, p.120) The utilization of the text is dependent upon the reader's interpretive practices which are constituted by social relations rather than the mere idiosyncrasies of the reader/researcher. Analysis depends upon the insider's knowledge of the interpretive practices and schemata relevant to the reading of a particular text and her competence. Smith develops her argument as follows:

If the reader's interpretive practices conform to those intended by the text, analysis will display how the text makes sense (in those respects on which the research is focused). The capacity of analysis to disclose the accomplishment of the text's coherence is the proof (in they pudding sense) that the analyst has brought to the text an interpretive schema it intends. The enterprise depends upon the possibility of being wrong. It depends upon the possibility that the analyst may lack competence and the text, therefore, be impenetrable to her inquiry. (Smith, 1990b, p.120)

32 Smith's partial list include William Darrough(1978), Beng-Huat Chua (1979), Peter Eglin (1979), Alastair McHoul (1981), Ken Morrison (1981), Bryan Green (1983),and her own studies. As she states there are no doubt others. In fact, I learned of Emery Roe, author of Narrative Policy Analysis, on the world wide web, (http://mindlink.net/knowware/narrate.htm) too late to include his contributions in this paper.

33 [Smith] "developed the term not to identify a particular class of social events, but to identify how individuals' actual practices are articulated to and coordinated in social courses of action. As a concept it enables us to locate particular analytic sites, particular experiences, or 'evidences' (such as these texts) of a social process, as constituents of sequences of action in which many individuals and many individual courses of action play a part. Actual sites, experiences, or evidenced events are located in temporally ordered sequences of social action. Social relations appear as patterned and recurrent in the methodical accomplishment of the orderly social character of events, things, persons, objects, etc., but are not to be sought as the recurrence of patterned sequences of action." (quoted from Smith, 1990b, p.121)
Texts originate in a specific local context for which they are articulated and enter the public textual discourse at a particular moment in local political history. They articulate and interpret a course of action, representative of proper organizational behaviour. Because our emphasis is not on what has happened but on interpretation, Smith refers to this textual operation as the documentary method of interpretation. She summarizes Garfinkel to make her point.

The method consists of treating an actual appearance as 'the document of,' as 'pointing to,' as 'standing on behalf of' a presupposed underlying pattern. Not only is the underlying pattern derived from its individual documentary evidences, but the individual documentary evidences, in their turn, are interpreted on the basis of 'what is known' about the underlying pattern. Each is used to elaborate the other. (Garfinkel 1967a: 78 as cited and quoted in Smith, 1990b, p.139)

The synthesis of Smith's contention offers the grounds upon which my methodology, my subsequent findings and my analysis may be substantiated. "Professional and bureaucratic procedures and terminologies are part of an abstracted system...[and] are set up to be independent of the particular, the individual, the idiosyncratic and the local.... In actual operation ... the abstracted forms must be fitted to the actual local situations in which they must function and which they control. In practice the abstracted system has to be tied into the local and particular"(Smith, 1990b, p.153). The "local and particular" I am about to describe follows from the themes and questions established in the previous chapter.

34 The referent I would like read at this point is the texts of the technology plans and the background texts from the Ministry. Because the purpose of these texts is to set future direction I will and probably have designated them as policy.
Background

The Provincial Advisory Committee on Education Technology (PACET) was a 21\textsuperscript{35} member committee, comprised of key partners\textsuperscript{36} in the British Columbia public education system, was formed in March of 1993 and submitted its report to the Ministry of Education in the spring of 1995. The recommendations and interpretation of the Ministry objectives found in this document are responsible for the current course of education technology in the province today. The knowledge, skills, and attitudes for students to reach individual potentials, to participate fully in society, and to become responsible citizens was first on the list. Preparing them for careers and further education through increased emphasis on practical applications of learning with emphasis on graduating “good learners, critical thinkers, problem-solvers, clear communicators, knowledgeable about technology, able to search out and apply information from many sources, self-directed, and able to work well with others” was the second objective. High-quality services, programs, teaching and instruction with equitable access for all\textsuperscript{37} students being assured, were the third and fourth objectives. The last objectives included the provision of cost-effective and efficient delivery of services, programs and resources to students and accountability for educational decisions, resources allocated and results produced.\textsuperscript{38}

\textsuperscript{35} There were 2 numbers given in the report 21 and 23. I have arbitrarily selected one of them.
\textsuperscript{36} See Appendix A at URL: http://www.etc.bc.ca/provdocs/pacet/ for list of participant groups and full report. Personally, I would have liked to have known the identities of the participants, especially their positions in the institutions that they represented and their gender. I would speculate that the composition of females would be less than 35 percent. The positions of the participants would be by in large at the middle management level or higher.
\textsuperscript{37} My emphasis. The needs of all students, including those who face particular challenges because of geographical, physical, mental, or social factors were to be to ensured.
\textsuperscript{38} These objectives are available online at URL: http://www.etc.bc.ca/provdocs/pacet/minobj.html
There were a number of assumptions and strategies that served as the foundation for the 31 resulting recommendations. I have chosen to reproduce those which had a direct influence on the details of the plans upon which I aim to concentrate later in this paper. It is these assumptions and strategies which I believe represent the underlying beliefs about technology and the ways and means of its intended adoption.

- Students and teachers must have access to new-media technologies since their use is critical to the success of current efforts to reform the education system...
- The skills acquired by students through the use of technology are essential to meet their future career and life-long learning goals.
- Planning for the effective use of information technologies must be undertaken at all levels of the education system.
- Information technology is not an accessory. It must be seen as an essential part of all school programs.
- Information technologies can help create a more equitable and accessible public school system in BC. Urban students can use technologies to access courses not available through their school, rural students to complete their education without leaving their community, and adults to create a flexible study schedule that can accommodate both work and family.

[The proposed] strategic directions:

- Effective planning for the use of technology is essential to its long-term implementation in schools.
- Implementation of technology in schools demands a broad approach to teacher, student, and classroom issues. Included in these issues are: access to appropriate hardware, software, networks, training, and support; and a curriculum which integrates the use of technology.

During the time that PACET was meeting, two other documents, harbingers of the substance of PACET's report, Putting Policies into Practice: Implementation Guide; August 1994 and The Kindergarten to Grade 12

39 See section 3.3 of this chapter for the particulars of these details and their justification.
40 Full text of the Assumptions and Strategies is available at URL:
Education Plan; September 1994, were distributed to the schools. The first of these documents, Putting Policies into Practice, presented its content in terms of objectives and commitments. The objectives included such familiar items as those in the PACET Report: “knowledge, skills and attitudes necessary to prepare them [students] for careers and further education”; to ensure teaching and instruction are of the highest quality; and to ensure equitable access for all students to high quality services and programs. The Ministry of Education identified its position of commitment in a number of areas. They began with the goals of education as follows: “These goals and the public school system attributes of accessibility, relevance, equity, quality and accountability” (p.4) are the basis for the above objectives and commitments below. Again, I specify those I am particularly interested in seeing if they were folded into district technology plans.

- develop understanding of science and understanding and use of technology
- work to eliminate racism in schools
- promote gender equity in all programs and services and work to eliminate sexism in schools
- ensure appropriate technology is used in the delivery and support of education programs and services

Technology as a “strategic initiative” evolved from Putting Policies into Practice. In September of 1994 a further document was released called The Kindergarten to Grade 12 Education Plan. Once again the government position on the importance of information and computer technology in education as an “integral part of the required provincial curriculum” (p.9) is

http://www.etc.bc.ca/provdocs/pacet/assump.html

41 • Intellectual Development (prime goal of schools, supported by the family and the community)   
• Human and Social Development (goal shared by schools, the family and the community)   
• Career Development (goal shared by schools, the family and the community)
represented and their commitment to "providing regionally-based technology training for teachers" (p.9) is affirmed.

Students need access to a range of information sources to develop the technological literacy demanded in the workplace and at home. Teachers need the opportunity to choose technology that is appropriate for their students and to obtain the support they need to learn how to use this technology effectively. (p.9)

The foregoing is essentially a short history tracking the origins of a British Columbia Technology Initiative (1994-1996) from which the references to planning, technology, curriculum, implementation, and "equity" were extracted. These documents form the foundation for Technology in British Columbia Schools: Report and Action 1995 to 2000 (1995). This report was broadly distributed to the education community and the public. It is an example of Ministry of Education's discourse when disseminating public policy, as well as another illustration of Bryson and De Castell's description of the modernist's "true story" wherein "computer literacy" is the "necessary rite of passage youth born into the "information age." (1994, p.203)

All B.C. students will have access to information technology tools and skills that lead to future career and learning success. All students...will acquire computer literacy...p.1

Technological literacy builds on our aims for education by providing students with the resources to make informed choices about future work and education. (Harcourt and Charbonneau, n.p.)

New technologies are represented as "well planned, cost effective, and

42 The quote preceding is also an example of Bryson and De Castell's "true stories".
43 Technology in British Columbia Schools: Report and Action 1995 to 2000 . (1995) All quotes in this section will be from this document unless otherwise indicated.
affordable, and with their addition into the schools] significant social and empirical problems will be resolved and the quality of life improved" thus providing further evidence of a romanticized truth tale (Bryson and De Castell, 1994, p.203) as follows:

Recognizing current financial realities, provincial goals will be achieved through equitable distribution of funds and by working with school districts, the computer industry and other business and education partners to share costs. The public school system will build partnerships with technology vendors, businesses and associations to provide additional funds and services. (p.1)

Technology will be used not only to teach computer and media literacy, but as instructional support in all areas of the curriculum.... the computer and other information technology must become a general tool that students use to acquire knowledge and solve problems in all subject areas. (p.1)

The results of the School Technology Plan will be: more technology resources for schools, teachers and students; stronger partnerships between the provincial government and business to meet the technology challenges faced by schools; more relevant learning materials; better electronic links between schools; improved distance education; and an improved foundation and basis for integrating technology with learning in all parts of the province.44 (Harcourt and Charbonneau, n.p.)

Bryson and De Castell (1994) argue that narratives about educational computing represent “differently ordered sets of assumptions about the nature of knowledge, the purposes of schooling, investments in specific constructions of gender/race/class identity politics, and the scope ---and the limits---of computer technology in the classroom” (p.202). They argue that the constraints of technology are principally limited by people’s interpretation of the technology. The limitations and restrictions of the technology itself are

44 This is the final quote from Technology in British Columbia Schools: Report and Action
secondary to that occasioned by its interpretation. In fact, it is these limitations and restrictions which have the potential to initiate differently constructed teaching relations between students, teachers, and educational technologies (Bryson & De Castell, 1994, p.202). Narratives also reveal a tacit definition of success and by omission, failure.

For to a large extent this process of recognizing and rewarding only a sub-set of activities or accounts tells us at the same time both how success is defined, and why such definitions are arbitrary. What will count as failure from within a given story, tells us, for example, what that will exclude in terms of prospective uses of that technology. And, perhaps most importantly, here it is that we see how educational technologies can become technologies of normalization, and at what educational cost such normalization is achieved. (Bryson and De Castell, 1994, p.217)

**Ministry Requirements**

I find Bryson and De Castell's perspective most instructive especially when applied to the task of analyzing the Ministry of Education's requirements for technology planning. Success is defined by numbers, ratios, and hardware installations. Accountability will be measured by the purchasing of "stuff" with the proof reckoned by an audit. On the other hand, the educative purposes and the training of staff to implement those unspecified purposes are condensed into a single nonspecific requirement of an outline.

On June 14, 1995 superintendents and secretary-treasurers were sent a letter notifying them that a three-year draft district technology plan was


45 This "prediction" is founded in fact as the 1996-1997 funding was predicated on an
required in order to receive their district's portion of the $10.7 million targeted Technology Fund. This letter followed the May 1995 announcement of the five-year technology plan for British Columbia schools referred to in the above section. The plan was to indicate how "the district is addressing the following priorities:" (Correspondence, June 1995)

a) equitable distribution of education technologies within District;
b) how the District intends to meet the student to the computer ratios of 6:1 (or better) at the elementary level and 3:1 (or better) at the secondary level;
c) outline of a teacher training and support program designed to enable all teachers to integrate technology into their classroom learning environment;
d) District planning for installing, maintaining and upgrading school Local Area Networks (LAN) and connections to a Wide Area Network (WAN);
e) linking the District technology/business plan to curriculum implementation priorities;
f) electronic Internet access by secondary school students to the Post Secondary Application Service of British Columbia (PASBC) (Correspondence, June 1995)

The receipt of funding was and continues to be subject to the following terms and conditions:

The funds received hereunder shall be only used in connection with the Project Plan to purchase the following:

a) hardware including, but not limited to, desktop personal computers, servers, LAN connections and devised, WAN connections and devices;
b) software including, but not limited to, productivity software, Computer Assisted Instruction software, computer assisted learning systems, integrated learning systems;

accounting for the spending of the 1995-1996 funding.

46 I think the "is addressing" is an interesting choice of tense because there is an assumption that districts have already begun to address the priorities the Ministry has determined as important. What I find striking in this assumption is the lack of references to previously stated goals in other government documents which mention technology. The Ministry's isolation of the technology plan from the implementation of the IRP's (Integrated Resource Packages) (or what has been termed curriculum in the past) and other new policies is striking. This oversight sets the tone for what will follow in the plans.
c) information services including, but not limited to, connections to enable access to news, information and video services. (Correspondence, June 1995)

The most revealing section of the requirements is to be found in the terms and conditions for receipt of funding. The financial support for "Computer Assisted Instruction software, computer assisted learning systems, [and] integrated learning systems" augurs an unfathomed shift in how education is delivered. The seeds of Apple and Jungck's (1990) warnings about the deskilling of teachers appear to have been not only planted but also have germinated. Leonardo extends this concept to include a reconstruction vision of "social reality".

"But power is more than an authoritative voice in decision making; its strongest form may well be the ability to define social reality, to impose visions of the world. Such visions are inscribed in language and enacted in interaction." (Leonardo, 1991, p. 197)

The apparent "social reality" interwoven throughout the preceding "policy" is one which short shifts teacher training. Has its indispensable significance been purposely overlooked? Are the policy-makers blind to its significance? Has their attention been drawn to the hardware and software because of its visibility and political consequence? When pedagogic issues are vital to the effective use of computers, why have they been overlooked in policy? The politically savvy might answer that the cost of training and support comes from a separate budget. Be that as it may, the message of the text remains intractable. The irony of the words found in the text of

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47 I realize that my claim is unsubstantiated but in light of the evidence from Chapter 2 and the forthcoming evidence, the likelihood is that the policy-makers are substantially (80-90%) male.
48 I would include teacher training here as well as the broader pedagogic issues found in teaching and learning.
Educated and literate citizens are not just an economic goal but an essential of a democratic society - one in which all citizens have the capacity, knowledge and resources to participate in making critical choices that will shape our society, its values and its institutions. (Harcourt and Charbonneau, n.p.)

**Counting Teachers**

Women are still in the unfortunate position of having to count who's for 'em and who's agin 'em.

Counting has its own problems, through creating what columnist Ellen Goodman has referred to as the new math: every time we stop adding, somebody starts subtracting. The minority members of any group or profession have two choices, Goodman has said. “They can keep score or they can lose.” And the scorekeepers are the ones who are scorned for being petty or tiresome. Always, she adds, it’s the minority that must do the counting - keeping score, recording progress to keep from falling further behind.

Yet what kind of minority are we talking about here? It’s a peculiarity of the plight of women in America that they should still be regarded as a minority, when they constitute more that half of the nation’s total population...

Numbers don't necessarily translate into power, however. Though so many women are working today, they're not often the bosses - in education or the larger society. Though the messages we give our daughters are changing, still we're are slow in coming to grips with what it means to have women at work. We change our most basic roles - when we find the power to change them at all - painfully, even resentfully. (Robert Cole, 1986, p.482)

This section is about counting teachers: counting the number of women in British Columbia who work full-time and part-time in education;

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49 The next two sections are about counting, both teachers and students. The Appendix
counting the number of women who are new to teaching; counting the number of professional and standard certificates held by women; counting the women in administration and counting the number of women who are teaching the courses “relevant” to the technology initiative. The provincial picture of the people who teach and what they teach serves several purposes. First, the figures are public information and they contain documented evidence of a government policy that has had minimal influence on the educational front. Second, as the foregoing quote succinctly stated: [We] can keep score or [we] can lose. Lastly, keeping score is about accountability and assuming responsibility. The previous chapter established the “problem” and I suggest a partial solution could be found by ensuring that previous government policies are extended into later initiatives and the terminology of new initiatives are developed with attention to common meanings. An example where the Ministry’s requirement for the “equitable distribution of education technologies within District” might have influenced or sparked some discussion if there was an indication as to how the term was to be applied. The use of the term within most technology plans, in fact, demonstrated the understanding that equitable meant equal distribution of hardware. An extended definition was rarely entertained.

In the 1995-1996 school year females make up 62.92% of the professional education staff in British Columbia. Of those regular school

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50 I am using this term in the pejorative sense.
51 See the Ministry of Education’s and Ministry Responsible for Multiculturalism and Human Rights’ 1991 joint publication of Gender Equity: Distribution of Females and Males In the British Columbia School System and any one of the current Integrated Resource Packages (Curriculum documents)
52 In the case of the School District No. 38 (Richmond) plan I was able to extend the definition so that the broader definition was included.
educators new to teaching in British Columbia, 69.25% are female. In positions of special responsibility\(^{55}\) of the 27 people hired in 1995-1996 school year, 13 (48.15%) are female. Of the 7,216 part time educators employed provincially, 88.36% are female. Women hold about 86% of the standard\(^{56}\) certificates and 60% of the professional\(^{57}\) certificates. These numbers show that the women in the system appear to have more “schooling” than the males. Yet more males are in positions of responsibility\(^{58}\) than females. Even

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55 Special responsibility is differentiated from regular teacher and includes positions such as principal, vice-principal, department head, and the joint role of regular teacher and administrator.

56 Standard certificates are issued at the completion of a 4 (and sometimes 5) year program resulting Bachelor of Education degree. There are people in B.C. with a permanent standard certificates who have only 3 years of studies and no degree in the Faculty of Education. As of 1990 these people were grandfathered and now standard certificates are only issued at the completion of a degree.

57 Professional certificates are issued at the completion of a Bachelor's degree (in any Faculty) and one to two years of a professional program in the Faculty of Education. By the year 2000 the Faculty of Education / College of Teachers will have the right to determine which Bachelor's degrees are approved for admittance into the Faculty of Education.


58 Special responsibility is differentiated from regular teacher and includes positions such as principal, vice-principal, department head, and the joint role of regular teacher and
though observations like these are not new and not unusual; in point of fact, they are the norm. For the purposes of this research, I wish to concentrate on who is doing the teaching and in which subjects.

I have taken the subjects of English, Visual Arts and Learning for Living to establish a reasonable reference point from which to judge other subjects. Results indicate that:

- 49.7% of teachers teaching English are female
- 44.87% of teachers teaching Learning for Living are female
- 51.43% of teachers teaching Visual Arts are female.

administrator.

58 Standard certificates are issued at the completion of a 4 (and sometimes 5) year program resulting Bachelor of Education degree. There are people in B.C. with a permanent standard certificates who have only 3 years of studies and no degree in the Faculty of Education. As of 1990 these people were grandfathered and now standard certificates are only issued at the completion of a degree.

58 Professional certificates are issued at the completion of a Bachelor's degree (in any Faculty) and one to two years of a professional program in the Faculty of Education. By the year 2000 the Faculty of Education / College of Teachers will have the right to determine which Bachelor's degrees are approved for admittance into the Faculty of Education.

58 The following extensive quotation from Cecilia Reynolds and Beth Young's book, Women and Leadership on Canadian Education offers some insight on why this might be so.

"Women interviewees tend, as a group, to emphasize their credentials, hard work, workaholism in fact, and great attention to detain in meeting all the requirements for the next stage up the ladder. They tend to assume that their superior qualifications and hard work will lead to advancement, while men interviewees tend to stress the importance of visibility and connections. Male careers appear to get more of a head start as a result of contacts with other males who have relevant experiences and information to share, and men tend to be proactive, seeking out such aids to advancement. Women appear eager to please and to fit in and are careful not to be seen as aggressive in pursuing advancement. They may challenge sexist practices, but only indirectly through such things as the use of humor. They appear to try to very systematically accumulate all the required credentials and experience they believe are needed in order to advance. They talk often about the confidence this provides them. Male interviewees appear to be more relaxed about the career advancement process. Only one even uses the word "confidence," using it to say that he was confident he could do a particular job despite not having fulfilled all the experience requirements which most people assumed were prerequisites to promotion. Men see individual contacts and networks as important to the process of advancing a career. Several male interviewees describe skipping steps in the credential or experience hierarchy and make no apology for doing so. " (Reynolds and Young, 1995, 130-131)

59 See the Ministry of Education's and Ministry Responsible for Multiculturalism and Human Rights' 1991 joint publication of Gender Equity: Distribution of Females and Males In the British Columbia School System for a more in depth look.
Examining subjects considered traditionally ghettoized according to gender (Acker, 1994), the results were as follows:

- 87.76% of the teachers teaching Home Economics are female
- 4.36% of the teachers teaching Industrial Education are female.

An analysis of the gender-differentiated staffing of courses in the domain of computer technology revealed the following:

- 28.6% of the teachers teaching Mathematics are female
- 26.9% of the teacher teaching Science are female
- 11.77% of the teachers teaching Computer Education are female.

Fig. 3.2

PROVINCIAL TOTALS - GENDER COMPOSITION OF EDUCATORS BY SUBJECT

<table>
<thead>
<tr>
<th>Subject</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning for Living</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
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<tr>
<td>Math</td>
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<td></td>
</tr>
<tr>
<td>Industrial Education</td>
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<td></td>
</tr>
<tr>
<td>Home Economics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0%  20%  40%  60%  80%  100%
Figures such as these beg some questions. Is preferential treatment accorded male educators in teaching assignments? Are there fewer women trained to fill these positions? Are subtle practices of covert sexism\textsuperscript{60} in operation? If nothing is changing for women, what radical means ought to be employed in order to bring about change?

May I also remind you that most of the professions have been open... When you reflect upon these immense privileges and the length of time during which they have been enjoyed... you will agree that the excuse of lack of opportunity, training, encouragement... and money no longer holds...

(Woolf, 1929, pp.121-122)

**Counting Students**\textsuperscript{61}

But whatever effect discouragement and criticism had upon their writing - and I believe that they had a very great effect - that was unimportant compared with the other difficulty which faced them... that is that they had no tradition behind them, or one so short and partial that it was of little help...the weight, the pace, the stride of a man’s mind are too unlike her own for her to lift anything substantial from him successfully... there was no common sentence ready for her use.(Woolf, 1929, p. 83)

When counting teachers I used the subjects of English, Visual Arts and Learning for Living to establish a reasonable reference point from which to judge other subjects. All students are required to take courses through Grade 11 in

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\textsuperscript{60} Please note that Home Economics is included because “sexism” operates in this field, as in computer studies.

\textsuperscript{61} All figures are from Report 2069 (1995-1996) School Year: Public School Secondary Course Headcount Enrollment By Grade, Subject Area, And Gender Within District.
English and through Grade 12 in Learning for Living whereas Visual Arts is generally an elective. English and Learning for Living in Grades 8-11 have an average of 49.2% and 47.97% enrollment of females respectively. These figures are not far removed from the representation of female instructors for these courses which are 49.7% and 44.87% respectively. In Visual Arts coursework in grades 8-11, 51.31% of student enrollment is female and 51.43% of the instructors are female. Female students are able to see themselves reflected in the faces of their teachers.

The enrollment patterns of traditionally ghettoized subjects such as Home Economics and Industrial Education are examined in order to compare trends. Beginning with Home Economics, the average number of females per course is 74.06%. There are some wide variations in the enrollments when subject and grade specific courses are highlighted. In Home Economics 8, a subject where many schools encourage participation, as evidenced by 9,301 students enrolled in the course, 53.4% of the students are female. In Clothing and Textiles 9, where 1,711 students are registered, 95.1% of the participants are female. The pattern in Clothing and Textiles remains constant through grade 12 with over 95% of the students, female. In Foods and Nutrition 9, with 6,444 students, 58.9% are female. The percentage of females also remains relatively constant with between 58.9% and 62% female students through grade 12. Enrollment declines from a high of 6,444 in grade 9 moving to 4,769 in grade 11 and a low of 1,560 in grade 12. In Home Economics 87.8% of the instructors are female. Of the courses offered in Home Economics, Foods and Nutrition is by far the favoured course for boys in grades 9 and 10. Cook Training begins in grade 11, with 288 students enrolled provincially.

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62 Two Fine Arts credits are necessary in the Grade 11 and 12 years in order to qualify for graduation.
63 Also called Career and Personal Planning Grades 8-12. Guidance 8-11 has also been included in these figures because some districts have not fully adopted the new curriculum
42% are female.

The enrollment patterns in Industrial Education are quite different than those of Home Economics. In Home Economics there are several entry level courses offered. For example, a general introductory level course is offered in grade 8 and further introductory courses offered in grade 11 in Clothing and Textiles as well as Foods and Nutrition. In the introductory course, Foods and Nutrition 11, there are 1,154 students enrolled provincially and 57.1% of these are females whereas the sole introductory course in Industrial Education is in grade 8. Other courses are not identified as introductory which might serve to exclude those who otherwise may have an interest. Furthermore, the number of female role models both as instructors and companions\(^64\) are too few for comfort\(^65\).

Industrial Education is offered in grades 8 through 10. In grade 8 of the 10,224 students enrolled, 42.1% are female. Industrial Education 9 had 7,516 students enrolled with 17.1% of those female. By grade 10 only 16% of the 9,792 students enrolled are female. As the subjects become more specialized\(^66\) the percentage of female students taking these courses further declines. A slight increase in the number of females occurs briefly in Drafting 11 where 20.7% of the 3,196 students are female. The most striking anomaly is the extremely low number of female instructors (4.36%) in Industrial Education.

Enrollment patterns in Mathematics, Science and Computer Education are also examined in order to see the provincial trends. In Mathematics 8\(^67\) of

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\(^64\) e.g. other female students.
\(^65\) "...that is that they had no tradition behind them, or one so short and partial that it was of little help...the weight, the pace, the stride of a man's mind are too unlike her own for her to lift anything substantial from him successfully... there was no common sentence ready for her use." (Woolf, 1929, p. 83)
\(^66\) e.g. Construction 11,12; Electronics 11,12; Metal 11,12; Mechanics 9, 11,12; Technology 11, 12; Welding 11,12; Drafting 11, 12; and Carpentry, 11,12.
\(^67\) These figures do not include Mathematique 8-12. There were 2442 students enrolled in
the 36,489 students enrolled, 48% are female. The percentage range of females enrolled in Mathematics 8 through 12 remains constant (between 47% and 48.9%). The number of students enrolled in Mathematics does decline by grade 12 with 29,387 enrolled in grade 11 and 13,622 enrolled in grade 12. Only 28.6% of the instructors teaching Mathematics are female.

In Science 8 of the 32,466 students enrolled, 48.2% are female. Science 9 and Science 10 have 48.25% and 48.5% female students respectively. In grade 11 and 12 when specialization in Science begins we begin to see a quite different pattern emerge. Of the 16,164 students enrolled in Biology 11, 59.3% are female. Biology 12, with 9,473 students enrolled, has 63.2% female students. Chemistry 11 enrolls 52% female students and Chemistry 12 enrolls 50% female students. Physics 11 and 12 have 39.7% and 33.4% female students respectively. In Science and Technology 11 of the 3,618 students enrolled, 39.1% are female. Only 26.9% of the instructors are female. The number of young women enrolled in Biology, Chemistry and Mathematics are indicative of an increase of women in medical careers such as medicine and pharmacy where these courses are prerequisite. Traditional careers such as nursing and ancillary medical fields which employ predominantly women also have these prerequisites.

total. Because I do not know the percentage of females who enroll in French Immersion as compared to the percentage of males who enroll I felt that the trends in this program might not be generalized to the general student population. Nevertheless, the following figures are included: Mathematique 8: 60.1% of a total of 1044 students were female; Mathematique 9: 54.2% of 738 students were female; Mathematique 10: 58.8% of 522 students were female; Mathematique 11: 54% of 113 students were female; Mathematique 12: 48% of 25 students were female.

68 In the 1995-1996 School Year there were 49,444 students enrolled in Grade 11 (24,206 female) and 45,877 (22,651 female) students enrolled in grade 12.

69 There are 10,403 students enrolled in Physics 11 and 4,654 students enrolled in Physics 12. Advanced Placement and International Baccalaureate students have not been included in any of my figures.
The figures for students taking Computer Studies are incredibly small when compared to the total number of students registered in grades 11 and 12 provincially. In Computer Studies 11 there are 6,422 students and 35.1% of those are female. In Computer Science 12 there are 1,947 students and 23.2% are female. Only 11.77% of the instructors in this area are female. Because Computer Science is a specialized subject, perhaps a broader perspective ought to be taken in terms of student exposure to computers. The problem with extending the exposure to computers is in the "type" of course generally associated with computers and the career opportunities associated with this exposure. I am referring to Business Education and its long standing association with secretarial work. In the provincial listing of courses in this area there are courses in Keyboarding (8,9,11), Data Processing (11-12) and Information Management (11-12). Female students are enrolled in greater numbers than the males with the exception of Keyboarding 8 where 51.7% of the students are male. Data Processing (11-12) has an average of 61.8% female participation and Information Management (11-12) has an average of 74.6% female participation. A move toward balance between females and males is represented in courses like Economics 12 (43.2%), Marketing 11 (48.3%), Marketing 12 (48.9%) and Business Management 12 (49.3%), although the males have a slight advantage. In Business Education 42.6% of its instructors are female.
"What's Taught in School[s] Matters"  

One reason why young people are of such concern to us is that they are poised between childhood and... old enough for their choices and aspirations to be consequential, for themselves and for society... They are the focus for change, the new generation... (Gaskell, 1992, p.139)

What is taught in school matters. Teachers provide an account of how the world works and they qualify and certify students for the job market. The organization and stratification of knowledge in the school, the specific inclusions and exclusions of knowledge, tend to be taken for granted by those in the school, but must be understood as historically, ideologically and politically based choices. What is the possibility of changing stratification of knowledge in secondary schools? What is the possibility, especially in vocational classrooms, of a critical pedagogy that holds up existing patterns of gender and class inequality for examination?(Gaskell, 1992, pp.140-141)

The unit of analysis in the two previous sections is gender. Counting the teachers and the students reveals differential course enrollment with comparable patterns appearing with course instructors. This tendency is historically identifiable and entrenched.  

70 Gaskell, 1992, p.140.  
71 See the Ministry of Education's and Ministry Responsible for Multiculturalism and Human Rights' 1991 joint publication of Gender Equity: Distribution of Females and Males In the British Columbia School System.
relationships. (Gaskell, 1992) Gender segregation in schools and the labour market is hardly a new phenomenon yet I am about to continue the documentation, censure and theorizing of coercive practices as evidenced in district technology planning in this thesis. If knowledge of inequity is not necessarily the catalysis for change then what is? The issues are complex. Adding in the women is not an acceptable answer when gender differentiation has been built into the organizing structures, practices and curriculum of the schools. All students are affected in one way or another.

Purposely I have isolated a few subjects which suggest streaming. Although streaming occurs for a variety of reasons there is evidence that a student’s interest and ability may be shaped by factors such as gender, social class, culture, and ethnicity. (Gaskell, 1992) These contributory factors are incorporated into school practices and organizations. The chart is also included because it demonstrates how relatively few students in British Columbia have “access” to advanced science courses and courses which might be thought to promote or include access to technology. When the enrollments are viewed in light of the collective enrollment in grades 11 [24,206 (F); 25,238 (M)] and 12 [22,651 (F); 23,226 (M)] actual course enrollments appear quite limited. There are likely additional variables to consider, such as career preparation and locally developed courses which contribute to this picture, but

72 I wish to [re]emphasize the extended definition that appears in Chapter Two and include the “Principles of Gender Equity in Education” as they appear in all the Integrated Resource Packages in Appendix C: Cross-Curricular Interests.

• All students have the right to a learning environment that is gender equitable.
• All education programs and career decisions should be based on a student’s interest and ability, regardless of gender.
• Gender equity incorporates a consideration of social class, culture, ethnicity, religion, sexual orientation and age.
• Gender equity requires sensitivity, determination, commitment, and vigilance over time.
• The foundation of gender equity is co-operation and collaboration among students, educators, education organizations, families, and members of communities.

73 My figures include provincially prescribed courses only because the government data I have obtained does not include career preparation or locally developed courses.
these are beyond the scope of this paper. Nonetheless, with an increased emphasis on "develop[ing] understanding of science and understanding and use of technology" juxtaposed with the applied science focus inherent in the Industrial Education courses cited there is a troubling lack of emphasis / interest apparent. This same situation is also evident in the traditionally academic science courses cited.

The Ministry of Education document *Putting Policies into Practice: Implementation Guide; August 1994* specifies the promotion of "gender equity in all programs and services" in addition to working "to eliminate sexism in schools." It also ensures that "appropriate technology is [to be] used in the delivery and support of education programs and services." Are these discrete policies with no relationship to one another except that they appear in the same document? Do we as educators have a choice as to which policies we enact? As previously stated, the intent of this thesis is to examine district technology plans to see how districts express their individual district policies in relation to technology. Are there references to gender equity or are the policies crafted to preserve the status quo? Perhaps, I should be asking a more arduous question: Does what is taught in school matter to the policy/plan makers? 

74 From *Putting Policies into Practice: Implementation Guide; August 1994*
75 The policy makers that I refer to include district technology planning staff(s) and the Ministry of Education.
Gender as Social Relations

When Simone de Beauvoir (1972) tried to describe how the world looked from the subordinate position of women, she focused on the way women are always in the wrong. If, in the middle of a discussion, she said, a man says to me ‘Oh you only think that because you are a woman’, there is very little that can be done. It is not possible to reply ‘And you only think that way because you are a man’ because woman and man are not terms of equal value. In male dominated societies, she says, where men are more important - on the grounds that they are more representative, more authoritative - ‘it is understood that the fact of being a man is no peculiarity. A man is in the right being a man; it is the woman who is in the wrong.’ (as quoted in and from Spender, 1982, p30)

Who Are the People Behind the Plans?

In light of the previous explanation of Dorothy’s Smith’s conceptualization about the construction of textual discourse, my question is a particularly apt one. The plans do offer some clues as to group affiliations represented within the committees who met to prepare the technology planning submissions. What is not at all evident is how the selection process operated to arrive at particular committee membership. Nor is it possible to identify who is responsible for the actual recording of the dialectic and writing of the text. This in itself would prove a fascinating study of technology planning dynamics. Because some districts acknowledged their committee members by first and last name I was able to determine the gender of the participants. Names that are androgynous were recorded as indefinite, although in some cases since I knew of the person I was able to record their

77 The following picture is from a Museum of Modern Art Postcard called Silence by Odilon
gender. There are only 21 districts which have sufficient information for this particular analysis.

As I have done in previously in this chapter, I have again applied a gender lens to see the balance of female participants as compared to male. I see the resulting numbers as identifying a trend, a trend that is highly recognizable and not at all unusual. Females, by and large, make up less than 30% of the committee members in 17 of the 21 districts for which I have data. Males, on the other hand, make up more than 50% of the participants in 18 of 21 districts. The range of females in the committees runs anywhere from 0% to approximately 44%. When males fall in the 40% range, the indefinite category ranges between 14% and 22%. The balance, I believe, would shift significantly, if the gender of the indefinite people was identified in favour of the males. This is most likely to be the case due to the fact that when the numbers of committee members (253) represented in the 21 districts are taken together, 24.9% are female, 67.59% are male and only 7.51% are unidentified.

I was also interested in seeing the group affiliations of individuals who sat on the committees. These figures cannot be quantified in real numbers because by and large numbers were not consistently attached to the membership groups. More often than not, the group, rather than particular individuals from the group, was identified as represented within the text of the plan. In this data set, there were 25 districts who identified the group affiliation of their committee members. I found the classification process to be somewhat arbitrary. Job titles are not always indicative of status or group membership, nor are they consistent, between school districts. This is particularly true of consultants, coordinators and managers. People in these

Redon (1911) from the Lillie P. Bliss Collection.

78 See Appendix: Technology Committees Analyzed by Gender for chart.
positions were assigned to the position of other unless they were identified with computer attached to their position title, then they were placed under the computer/COORDinator consultant. In some districts the coordinator may be considered an administrative position, in others not. Therefore, they were kept in separate categories. Directors, Secretary-Treasurers, District Principals, and Assistant Superintendents and Superintendents were considered senior administration. Teachers were easily identifiable, with the exception of one district where several schools had systems managers. The likelihood is that these people are teachers given a special title because they have volunteered to troubleshoot with the school computers.

Despite these categorization snags and the fact that this information was available from about 40% of the district technology plans submitted, there are a few trends that can be extracted from this data. First and foremost, the chairperson of the committee is someone with administrative and decision making status. People with positional status did not necessarily outnumber those without positional status. Generally people with an identifiable connection or interest in computers were selected to be on the committees. People, like secretaries, support personnel\textsuperscript{79}, and librarians were less likely to sit on committees. Usually teachers were either represented or consulted by the committees. Most committees had some representation by parents, trustees or students. By and large most districts made an attempt to extend their committees beyond district staff representatives\textsuperscript{80}.

S.D.#15 (Penticton), S.D.#35 (Langley), S.D.#37 (Delta), S.D.#38 (Richmond), S.D.#39 (Vancouver), and S.D.#57 (Prince George) were selected

\textsuperscript{79} Classroom assistants, teacher aides, office staff and maintenance staff would be included in this category.

\textsuperscript{80} See Appendix : Technology Committees by Group Affiliation chart.
for additional analysis because there was some detail submitted as to how the committee process worked when constructing their plans. There are two consistent trends in all six districts. The first is that senior administration is represented in their committee structure and the second is that the female participation is consistently less than 30%.

The textual reality offers more insight as to how the plans were conceptualized and the planning process\(^{81}\) was carried out. A description of planning process as discerned from their texts follows for each of the six districts.

In S.D. #15 (Penticton) September 1995 saw the approval and establishment by The Board of Trustees of a District Technology Committee composed of representatives from The Board of Trustees, CUPE, the teachers' association (PDAT), the principals' and vice-principals' association (PVPA), and the Chamber of Commerce. The Secretary-Treasurer, the Assistant Secretary-Treasurer and the Superintendent of Schools were also included on this eight man committee. Three advisory (sub)committees were also established: Administrative\(^{82}\) Technology Advisory Committee with, Curricula Advisory Committee and Communications\(^{83}\) Technology Advisory Committee. The gender composition of these particular committees is interesting to note. The Administrative Technology Advisory Committee had one female secretary with the other eight members, all of whom were male with authoritative positions\(^{84}\). The Communications Technology Advisory Committee had one female member from the Penticton Public Library on its

\[^{81}\text{See Appendix: Representation by Process chart.}\]
\[^{82}\text{This committee appears with two different names: Administration Advisory Committee and Administrative Technology Committee.}\]
\[^{83}\text{This committee appears with two different names: Communications Advisory Committee and Infrastructure Technology Advisory Committee.}\]
\[^{84}\text{Secretary-Treasurer, Assistant Secretary-Treasurer, Principal, Vice-Principal, Director of Instruction, Owner-Valley Internet Provider, Partner-BDO Dunwoody.}\]
nine member committee. The female participants begin to make their presence known in the Curricula Technology Advisory Committee. Its chairperson is a representative from administration. On this 14 member committee there are six males, six females and two androgynous names.

The process used in S.D. #35 (Langley) to facilitate their many information technology related initiatives began with the District choosing to revisit how their ongoing technology initiatives were being coordinated. In September 1995 the District established a new Information Services Department. This department included a computer helping teacher, two repair technicians, a computer operator resident at the school board office, a supervisor and a technical support person with a range of services including software and systems support and a working knowledge of network and server technology. To assist the department in developing this Information Technology Plan, the District used the same approach as it previously had. The District Technology Advisory Committee was established as a standing committee with responsibility for the overall development of the District's strategic plan. The following three subcommittees reported to it: Technical Standards Committee, Curriculum Advisory Committee, and the Training & Pro-D Advisory Committee. The committees began their work by revisiting the work that had previously been done and then addressed a number of new issues.

In S.D. #37 (Delta) the planning was executed through a committee with input from "numerous submissions". The Technology Planning Steering Committee consisted of five males and two females. The positions represented were Secretary-Treasurer, Assistant Superintendent (female),

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85 This committee had the following representation: Assistant Secretary-Treasurer, Administrative Officer, CIO [sic] - City of Penticton, CIO - Valley First Credit Union, a business representative, two technicians and one technician/teacher from S.D. #77 (Summerland).
Assistant Superintendent- Education Programs, Director of Facilities, Director of Finance and Management Services, District Coordinator of Technology, Manager, Management Information Systems (female).

S.D. #38 (Richmond)'s technology plan employed the "District Planning Process", a process which had been developed for use at all levels of the organization. Its aim is to provide for broad representative involvement. A small working group\textsuperscript{86} prepares an initial draft which is distributed to a broad based Advisory Committee representative of the District and its community. Everyone is invited to review the draft and involve others in any manner they choose. All responses to the initial draft are requested in writing. The working group revises the initial draft on the basis of the first round of responses and distributes a second draft. The responses are compiled and made available for review by the Advisory Committee which is again invited to respond to the second draft in writing. A subcommittee (limited by available funding) participates in a half day meeting to discuss individual reactions and written responses from the other members of the committee. “The purpose of this meeting is to reach consensus where possible and to provide a full discussion of those issues which cannot be concluded in the time allowed” (S.D. #38, Richmond Technology Plan). The working group completes its final draft of the plan.

The plan then moves through a series of approvals. The Superintendent’s advisory body, the District Management Committee, reviews the plan makes any necessary revisions in consultation with the Director of Technology and Information Services. The plan is presented to the Board of Trustees for ratification and then sent to the Ministry of Education.

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\textsuperscript{86} Chaired by the Director of Technology and Information Services and made up of one female, myself and four males.
S.D. #39 (Vancouver) 's process was not explained within the text. The process might be viewed through the acknowledgments’ page which included the three members (all male) I have credited with authorship and principal contributors to the plan. The two other groupings included three focus group members (one female and two males) and the 11 member Curriculum and Staff Development Consultative Committee (six females, three males and one androgynous).

S.D. #57 (Prince George) commissioned Desharmis and Associates in 1993 to prepare a report to respond to "the rapidly changing requirements of an increasingly complex and technological world." The report found that there was "no strategy for the introduction and implementation of technology in classrooms" and that there was "little co-ordination of technology acquisition, inequities of learner and teacher access to technology, and very little training and technical support". A Technology Planning Task Force was formed. This Task Force was assisted in the writing of the District Technology Plan by B.C. Tel Advanced communications- Discovery Learning. A draft plan was debated at a public Forum in partnership with the Chamber of Commerce and the Task Force on September 28, 1994. A number of written critiques were also received by the Task Force. Community members and educators responded with comments, discussions and written input. A revised plan was presented to the Board of School Trustees on December 6, 1994.

I have entitled this section, Gender as Social Relations because I believe that the relationship within the committee structures mirror the relationship between gender and technology in the schools and in the broader societal context. Gender matters whether one is considering access to the technology or involvement in the decisions making processes associated around technology. Women are placed in positions where they have little or no chance of being heard or having influence. They are given the "soft" tasks. It
is interesting to note in S.D.#15 (Penticton) that the composition of the committee changes to include more women once the task becomes distanced from the technology. Then the women are permitted to become the majority of the Curricula Advisory Committee. Competence with the machines is, I presume, not necessary. What you need to be able to do is to use them when teaching and it is the women who do the majority of the teaching within the school system in British Columbia. Another observation, which follows from much of Michael Apple's work on deskilling and technology in education, is that curriculum, not unlike the technology, is something that is also generally removed from the direct control of teachers. In this province, new curriculum is being manufactured, mandated, and implemented at a pace that has never been seen before by the Ministry of Education. It is interesting that the women are placed on this committee, one where they can have little impact because they lack both authority and power. They may offer some "lame" recommendations that are not likely to be implemented because they will involve responsibility for the training of staff and for that there will be, as always, diminished funding.

I can speak personally about my involvement in the committee process. My contribution was accepted in the sections about people and staff development and access to technology. I was able to write about "ideas" but I had no status, no authority, no access to funding with which to enact these ideas. They are words, written residents, trapped on a page. The power, the status, the authority, and the access to funding rests in the hands of men in administration. I, as a woman am entitled to create the text, but the decisions are for others to make. "[This] feeling of being in a space that is not
one's own is familiar to women in a society marked fundamentally by patriarchy."\(^87\) (Magda Lewis in Lewis & Simon, 1991, p.261)

Another general comment that follows from the district planning committees is the hierarchical power relations that are apparent through the membership. When people with status from outside the institution are involved they are placed on the committees where those who have the power to make financial decisions reside.

Why would any of this be of importance? Why does it matter that women are not equitably represented on the technology planning committees? Why does it matter that their influence, their questions, their experiences are not reflected in the texts? Why does it matter that the institution of education continues to operate in hierarchical and gendered ways? After all, our social, economic, and political organizations are gendered. So what?

To say that an organization, or any other analytic unit is gendered means that advantage and disadvantage, exploitation and control, action and emotion, meaning and identity, are patterned through and in terms of a distinction between male and female, masculine and feminine. Gender is not an addition to ongoing processes, conceived as gender neutral. Rather it is an integral part of those processes, which cannot be properly understood without an analysis of gender (Joan Acker (1991) as quoted in Acker, 1995, p.132)

**So, what difference does it make?**

Does it matter that "[m]ale administrators [make] administrative hiring decisions based on ingrained, socially reinforced personal biases such as beliefs that women are too sexual or emotional."(Calabrese and Wallich (1989) as quoted in Sadker, Sadker and Klein, 1991, p.283) or that the

\(^87\) Lewis and Simon (1991) use this terminology with reference to Hartman (1984) where patriarchy is defined "as a social system characterized by 'the systematic dominance of men over women'. It emerges as a 'set of social relations between men, which have a material
likelihood is that men will be rated as more competent than women for identical performances as well as receive more corrective feedback (Shakeshaft, 1986)? What possible effects could this have on our female students, our women teachers, and to the introduction of technology into our schools? What about the lone female on committees or at meetings who has her ideas listened to respectfully but then they are dismissed? Does it matter that women find their ideas often go unnoticed until they are picked up by a male in the group who is then credited with the idea (Reynolds & Young, 1995)? As a woman who has experienced each of these situations, it matters.

Magda Lewis speaks of an intact social repertoire. A repertoire that imprisons our governed selves. Women know, it is not what we say or how we say it, that is important to the group and our male colleagues. What is important to them is that we speak at all. On account of "a set of social relations where women's ideal discursive state within patriarchy has been defined as silence, a woman speaking is a political act (Spender, 1980). Under these conditions the very act or intention of speaking becomes an intrusion and a potential basis for a violent reaction on the part of those who have decreed our silence. Ultimately for individuals who transgress the limits of patriarchy, the forces of regulation are without a doubt swift, sure and relentless" (Magda Lewis in Lewis & Simon, 1991, p.260).

Listen to the voices of the women and the voices of the men; observe the space men allow themselves, physically and verbally, the male assumption that people will listen, even when the majority of the group is female. Look at the faces of the silent, and those who speak. Listen to a woman groping for language in which to express what is on her mind, sensing that the terms of academic discourse are not her language, trying to cut down her thought to the dimension of a discourse not base, and which, though hierarchical, establish or create interdependence and solidarity among men that enable them to dominate women."(p.257)

88 Technological/technology discourse could easily be substituted in this paper.
intended for her. (Rich, 1979, as quoted in Lewis and Simon, 1991, p.257)

For Wajcman (1991) and Menzies (1989) technology is an issue of control and power. Wajcman (1991) relates the control of technology to 'hegemonic masculinity'; "a core of dominant masculinity which is strongly associated with aggressiveness and the capacity for violence" (p.143). Technology as I have documented in Chapter Two is masculine. Where the difficulty arises is that the control and the power have consequences. Consequences that impact on the lives of those who do not access to the power. Hierarchies become entrenched. Schools are about education. Is the education one where girls learn that they do not have a contribution to make to society in the area of technology, whether it be its use, its social impact, or its creation; that their relationship to power is diminished because they are female?

Leonardo (1991) writes about power being more important than an authoritative voice in decision making. Power is important because it has the ability to define social reality and to impose visions of the world. These visions are inscribed in language and enacted in interaction. The technology plans are those visions inscribed in textual reality and are being enacted in the classrooms of our schools. The structures and composition of the technology planning committees are such that there is absolutely no chance for the hierarchical form and ideology of meetings to contest the discourse of the hierarchy, the source of power or the social, economic and political effects of the imposed technology. "The suppression of the local and particular as a site of knowledge has been and remains gender organized" (Smith, 1990a, p.18). Gender is a lens through which the social relations of gendered hegemonic power forms become visible.

"Taking up 'gender' from within, exploring social relations
gendering the particular local historical sites of women's experience, means attending to specificities, not gender in the abstract, not as total, but as multiple and sometimes contradictory relations. (Smith, 1990b, p. 159)

Central to this approach of analysis and inquiry is the positioning of myself as inquirer in the same world in which this text is written and read, and the same world in which the discourse of technology planning is brought into being as actual practices (of writing, producing, reading texts, of interpretation, of purchasing and distributing equipment, of the training and deployment of skills, of accessing and using the hardware and software, of living the actuality. As Dorothy Smith (1990b) argues convincingly in Texts, Facts and Femininity: Exploring the Relations of Ruling, “[w]e can only know society as insiders, regardless of the sociological artifices constructing social systems and structures as external to the knowing subject.” The inquiry/analysis does not dwell on or make an object of my personal experience but allows me to participate as a practitioner of the world I am a part of by focusing on the social relations which have organized the experience. My experience is not a synonym for perspective.

To begin from direct experience and to return to it as a constraint or "test" of the adequacy of a systematic knowledge is to begin from where we are located bodily. The actualities of our everyday world are already socially organized. Settings, equipment, environment, schedules, occasions, and so forth, as well as our enterprises and routines, are socially produced and concretely and symbolically organized prior to the moment at which we enter and at which inquiry begins. By taking up a standpoint in our original and immediate knowledge of the world, sociologists can make their discipline's socially organized properties first observable and then problematic.(Smith, 1990a, p.23)

The committee and writing processes that have been described in the preceding six plans demonstrate both of Smith’s (1990a) distinct socially
organized processes as evident in textual reality. The social organization of production is indisputable in each of the six districts featured as is the reading and interpretation process. A specific example of this occurred in S.D. #35 where the District Technology Advisory Committee began its technology planning by revisiting the coordination of ongoing technology initiatives. The three subcommittees began their work by revisiting “the work” that had previously been done and then they were to address “a number of new issues”. This suggests that the framing of technology as a concept was most likely predetermined by others and the groups were assigned to work within that framework. The following section is about Technological Determinism and it describes the themes and beliefs about technology which are found in the technology plans.

Technological Determinism

Three of the Ministry of Education’s requirements for district technology plans request details as to how districts intend to wire, install, maintain, upgrade, and connect computers to LANs, WANs, and PASBC while at the same time meeting “student to the computer ratios of 6:1 (or better) at the elementary level and 3:1 (or better) at the secondary level.” The result being that the predominant feature of essentially all district plans is a chart or some form of list; a listing of timelines, inventories, hardware and software shopping lists, computer operating systems, peripherals, modems, tape backup, standards, protocols, cabling, connections, funding, expenditures, equipment distribution, facilities and so on. These are the requirements, the critical technology tools, where numbers and technical language dominate; the

89 Local Area Networks (LAN); Wide Area Network (WAN); Post Secondary Application Service of British Columbia (PASBC)
starting point “for furthering technology integration into the education workplace”\(^{90}\). This area gains its credibility by providing a “technical” rationalist [accounting of machines and I have no interest in providing such an analysis.

I am interested in how people describe their connections to the technology especially from a policy perspective. Many districts had plans which adhered strictly to the six requirements for funding by the Ministry. In these texts there was no discourse around the concept of technology and how it might impact on their schools and system. This acquiescence to the “letter” is most likely indicative of unquestioning acceptance of the political, social and economic agenda of the technology initiative or indicative of those who view the exercise of writing a technology plan only as an exercise in compliance with the imposition of the more powerful social organization of the Ministry. There are likely as many reasons as there were districts for omitting the testimony of their discussions. It could even point to the fact that there was no discussion. A cursory examination of the plans reveals an uneven commitment to the process of technology planning. The plans vary in length from a few sparse pages to extensive reports of up to 100 pages.

**The Promises of New Technologies**

Many districts use the text of the technology plan to clarify and to express a set of beliefs about technology. This was overtly stated in one particular plan and as the following sections including many of the words from the plans will demonstrate understood in the others. The “plan includes considerable background information that is not specifically part of the plan.

\(^{90}\) Although this quote is taken out of context from S.D. #9 it is representative of the dispositions in the majority of the plans.
This is included because Information Technology is still a relatively new area for many people and for the plan to be effective it is important for all readers to understand what the issues are and where we are headed. As the plan matures over the next three years much of this background material will be amended or deleted."(S.D.#35) Four themes are evident in the district technology plans: Preparing for the Future, Technology as Teaching and Learning, Technology as a Tool for Change, and Technology Is Efficiency and Deliverables. The following quotation from Bryson and De Castell (1994) provides a canny summary for the overarching direction of all four themes in the following quotation:

Romantic tales of modernist technicists prescribe "computer literacy" as a necessary rite of passage youth born into the "information age." Within this view, a shift is posited from investing considerable effort in learning facts and mastering bodies of knowledge to strategically locating up-to-date information as a means to an end—the solution of significant problems—which is seen here as the key mechanisms that underlies scientific progress. Educational uses of computers, typically characterized within the technicist's view, as our most powerful information-processing technology, take a center-stage positioning, since the central aim of education, on this view, is to prepare students for effective participation in an economy that trades in "knowledge" and "solutions" as key forms of "cultural capital."(Bryson & De Castell, 1994, p.204)

The Promise of Technology For Teachers

I wrote the following section on the promise of technology for teachers for School District #38's Technology Plan. At the time of writing I had spent several years reading in the areas of technology, gender equity and staff development. As a teacher consultant at the district level I was working in schools and with district staff, school staffs and individual teachers. My job afforded me the opportunity to view curriculum and technology implementation from the perspective of the classroom teacher as well as from
the perspective of an individual who was given the job of supporting teachers and nonteaching staff in the implementation of the Science Integrated Resource Package (K-7). My previous years of experience as a classroom teacher and teacher-librarian have left an ineradicable memory of the realities of working as a teacher.

In my work with classroom teachers I heard first hand about their frustrations in accessing the necessary resource materials and equipment let alone, the paucity of time to learn new instructional and assessment practices amidst a host of other demands on their time. Demands, such as school-based meetings for Individual Educational Plans (IEPs), Staff Collegial Councils and an endless variety of ad hoc committees that ensue from expectations of teacher involvement in the running of the school, are oft forgotten as controlling factors governing teachers' non-instructional time. It also must be remembered that these school-based meetings do not include district special interest group meetings, the "drop-in" Resource / English as a Second Language / Learning Assistant / Teacher-Librarian / teacher colleague meetings, let alone the parents who drop in before and after school to have a "word" with the teacher. Add to this mix extracurricular offerings, "hall and playground" duty obligations, lesson preparations, public and parental expectations, the requirements/responsibility of professional development and 25-30 active students for approximately five hours a day and then, perhaps the intensification\(^{91}\) of teachers' work can begin to be fathomed.

Consequently, I believe that implementation of new curriculum, new technologies and new instructional and assessment strategies ought not to be introduced in discrete and isolated units. First and foremost, the

\(^{91}\) This term comes from Andy Hargreave's (1994) book, *Changing Teachers, Changing Times.*
consideration of the teachers' workload and working environment ought to be taken into consideration when planning for the introduction of educational innovations. For the past three years in my role as a teacher-consultant, I was witness to the introduction of an untold number of new Integrated Resource Packages with discrete, grade specific, prescribed learning outcomes and some 11 cross-curricular outlines. I recognized that practicing teachers do not have the resources or the time in their working day to make room for the profusion of innovations contained within the press of paper accumulating on their shelves. I am in no way denying our professional obligation as educators to prepare students for their places in society but I am seriously questioning our ability to do so within the current educational context without authentic reference and genuine support to the educators who work with tomorrow's adults and today's young people.

When I wrote the following I had at least four different groups in mind. Yes, I knew full well that I was writing for an audience and I had some

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92 The cross-curricular outlines include: Applied Focus in Curriculum, Career Development, English as a Second Language (ESL), First Nations Studies, Gender Equity, Information Technology, Media Education, Multiculturalism and Anti-Racism, Science-Technology-Society, and Special Needs. The Science Integrated Resource Package (K-7) states that: "There are a number of cross-curricular areas that have been incorporated into the Science Integrated Resource Package (K-7). These cross-curricular areas are represented in the prescribed learning outcomes in one or more of the other components of the IRP.

93 The complete text from which this quote is taken appears in the Appendix under School District #38 People-Staff Development.

94 The first group I wanted to hear the message was the Ministry of Education. In my heart I knew that it would do little good because the initiative was political and as such my small voice within a district plan would be unlikely to be heard. The second group that I wanted to reach was Administration and the Board of School Trustees. I wanted them to think about the impact of technology on their teachers and begin to question what changes they could make in the school environment to assist teachers in their "plight". Teachers were the third group. I wanted them to know that someone, in the this case it would appear to be the "district", had an understanding of what they were facing and was asking for their input through the many questions embedded in the sections of the technology plan for which I was responsible. The fourth audience was the unknown public. The public who were invited to review the district technology plan and the public who would read it online. Regretfully I must tell you that no one from any of the four audiences has responded to any of the ideas included in this text. Is the role of technology unimportant if it is to assist teachers in
specific points to make. The following text is representative of my personal beliefs and my desire to realize the promises of new technologies:

The promise of technology for students is well documented but what does technology promise teachers? There is always the promise of improving teaching with technology but what does this really mean? Technology is not a panacea for all educational needs. Nor does it appear that there is one best way for teachers to use technology, just as there is no one best technology for every teacher to use. Instructional goals, teacher experience, subject matter or curriculum area, available resources and support, and student needs are all factors that affect teacher's technology use. The use of technology as a resource to enhance student achievement and interest in learning is an attractive association which sells technology to teachers and parents alike. Is the relationship between technology and student learning so simple? Is teaching with computers and other technologies better than teaching without them? It is the answers to these questions which must guide our adoption and practice as we introduce and employ technology in the classrooms of Richmond.

Although helping teachers use technology well may be the most important step to helping students, there are almost no hard data on the impacts of technology on teachers; research has focused primarily on the implications of technology use for students. Simplifying daily tasks, such as record keeping, may be the most immediate way to involve teachers with technology.

Schools rarely consider the role of technology in assisting teachers with many parts of the job that take so much of teachers' time when students are not present. Because technology can assist teachers with their daily activities in many ways serious consideration should be given to supporting the work of teachers with technology. There are many areas to choose from. Exploration should proceed in a variety of directions: electronic grade book software, electronic databases to access current materials relevant to current curriculum revision and lesson planning, convenient voice mail retrieval for teachers in the schools, the planning and holding meetings on-line,

deutensifying their worklives? Is technology in our schools only for the few specialized individual teachers?.
electronic coordination of multiple schedules, the role of technology in training and professional development and the role of technology in the assessment of students, for example, videotaping student presentations. It is our belief that it does not matter whether or not teachers choose to use technology as a personal productivity tool or integrated into curriculum or for personal interest, all paths lead eventually to incorporating the use of technology into the classroom and will ultimately benefit the students of Richmond.

Common Barriers to the Implementation of Technology

"One of the clearest findings of the OTA case studies and research is that even very highly motivated teachers require substantial amounts of time, often a three to five year period, before they feel fully versatile with a complicated new technology and are able to expand technology tools to fit their particular teaching goals. And finding time in the teaching day and year for training, collaboration, and messing around with technology is the bane of the profession." (Office of Technology Assessment)

In order to succeed in the implementation of technology and the professional development of teachers it is important to identify and address the common barriers experienced by teachers in schools. Often these barriers may be expressed in terms of equipment issues, nevertheless, the solution to these barriers will be found through human resources and as such should be expressed in terms that demonstrate a sensitivity to the people who come up against barriers.

Access issues include not only the availability of computers or other appropriate technologies but also equipment which is inconveniently located. Limitations imposed by inflexible scheduling and computers assigned to specific curricular areas also serve as barriers to teachers who may want to use the technology. It is intended that accessibility issues be reviewed regularly by school staffs and decisions made be revisited in order that equitable and fair access to computers be established for all those teachers who are prepared and desire to integrate technology into their teaching and learning.

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95 Heading from the original document. See Appendix School District #38 People - Staff Development.
Preparing for the Future

Technology is said to be the means by which educators can address issues around diversity, resourcing, individual learning needs and prepare students for the future. Many plans included commentary on the many reasons why technology is crucial for today's students. Districts recognize the essentiality of mindful ongoing planning. There is also a subtle promulgation to teachers wherein the implicit message is that they are "responsible" for accomplishing this future for their students. The following is representative of their explanations:

At one time it may have been possible for school districts to choose whether or not they would be involved in technology. It is no longer a choice. In order to develop educated citizens as envisioned in the Legacy for Learners, the education system needs to better address learner needs by greater differentiation, greater choice, greater diversity, and greater freedoms for learners. Technology enables educators to "deliver" on these needs. (S.D.#75)
Ongoing 'Evergreen' Plan\textsuperscript{96}

It is essential that the Board of School Trustees develop and commit to an on-going plan which ensures consistent direction and effective utilization of technological resources. It is intended that this document and its supplements will provide a long term planning, technology guide. By submitting annual revisions with two-year projections, an 'evergreen' effect will be created. Using this strategy, the district hopes to be able to stay highly focused on immediate and long-term needs in technology within Mission. Until now, teachers in the Mission School District have not had clear direction regarding what students should be doing at each grade level with technology. Merely putting computers into the classroom or lab does not mean those resources will be used effectively. It is now realized that the growth of technology in society necessitates a whole new approach be taken in order to support student learning needs in a technologically advanced society. (S.D.#75)

It is a time for intense technological advancement in the world and the Ministry of Education has acknowledged this with "a new $100-million, five year School Technology Plan".[sic] This Ministerial initiative dovetailed nicely with the view of Golden School District No. 18 in as much as technology has permanently changed the world into which students will emerge. We can see these changes all around us in a variety of venues. Information technologies and electronic mail have changed the way in which knowledge is delivered to home throughout the country. An example of this was Desert Storm and the instantaneous viewing of what was happening minute to minute. Secondly, the nature of the workplace has drastically changed forever. No longer can workers locate a job where computers are not in some way connected to the job. Cashiers in stores, mechanics in service stations, professionals in all areas are faced daily with technological advancements. Technology, too is a catalyst for changing the way students learn and teachers teach. (S.D.#18)

\textsuperscript{96} Heading from the original document.
In the plans there is a simplistic recognition of the complexity of the innovation and the "drivers" which necessitate district technology plans and influence the direction of the plans.

If a district technology plan is to succeed, it must have built into it many support structures. A strong technology plan must address the following drivers:

- Curriculum
- Hardware
- Software
- Personnel support
- Technical support
- Networking

If any of these drivers are not addressed, the strength of the entire plan is jeopardized. A plan which emphasizes the purchase of new hardware and software without considering the other components is but a 'plug' approach to solving the deficiencies in technology in this school district. (S.D.#75)

An Eye on The Future

Our school system has been slower than the business, medical and scientific communities in the introduction of technology into the learning environment. Based on what is happening in this external environment, it is possible to gain some insight into what is possible and what to expect within the educational environment. This section is designed to stimulate further thought and discussion and assist in the decision making process as the district develops and implements a new technology plan.

1) The technology industry will progress more rapidly in improving learner and teacher access to, and interface with, technology to support learning and teaching. Key progress areas will include:

97 See the Ministry Requirements cited earlier in this chapter.
98 Heading is in original document. See Appendix School District #57 An Eye To The Future for a more complete text.
• much better human-machine interfaces, including voice input and pen-based systems.

• much greater availability of personal electronic assistants and personal electronic notebooks. This technology will become part of our day to day routines, including travel between school, home and work.

• much greater computer access in our homes. Home information retrieval systems and “edutainment” centers will be common. Connections will be made by means of telephone lines, cable services and satellite services to multiple entertainment, information and educational services. Fiber optic capabilities supporting interactive video between homes, businesses and educational organizations will be common.

2) telecommunication services, including electronic mail and access to on-line databases and fax. Computers will be networked within the school, district offices, association offices, community learning centers, post secondary organizations and government ministries. Communication by all learners and teachers will occur regularly on a district, provincial, national and global basis....(S.D. #57)

References are often made in the district technology plans to the need for a “directing body” of people to make sure that the plans proceed as they should. Two examples follow:

District Technology Committee\textsuperscript{99}

To see that the 'Evergreen Plan' is successful and continuous, the School Board needs to empower a District Technology Committee to manage the plan,

\textsuperscript{99} Heading from the original document.
set standards, implement Board policy, and deal with the rapid changes in technology. (S.D.#75)

Methodology

We began our Technology Plan by establishing a Technology Steering Committee. The members on the committee were:

- Bruce Ritchie, Director of Secondary Instruction, (Chair)
- Mike McAvoy, Superintendent
- Bob Eby, Assistant Secretary Treasurer
- Jim Hamilton, Planning and Communications Manager
- Doug Gardiner, Technician
- Mark McCulla, Director of Elementary Instruction
- Bob Kasco, Consultant
- Judy Hamilton, Computer Support Clerk
- Mel Maglio, District Resource Teacher
- Gaila Erickson, District Resource Teacher

To make sure that our plan reflected the needs of the District, we created a Technology Sub Committee which consisted of a minimum of one representative from each school. We had meetings with the Sub Committee members, visited and contacted each school, and consulted with administrative, support staff, and technicians. Information and suggestions from all areas of personnel contributed significantly to the outcome of our District Technology Plan. We placed high value on the principles of equity, currency, and ethics as we determined the direction of our School District Technology Plan.

...Recognizing the shortage of resources and the collaborative culture of the district, we are recommending a Technology Team approach:

District Technology Team Members
- Senior District Administrator (chair)
- District Resource Teachers
- Planning and Communications Manager
- Purchasing Clerk

100 Heading from the original document.
101 Please note the composition of the committee. It is additional affirmation of points made earlier in this chapter.
• Technician Lead Hand

The Team would be an action oriented group charged with making sure the plan becomes reality. The Senior District Administrator (likely the Director of Secondary Instruction) would be responsible to the Superintendent for the overall implementation of the plan, including monitoring and evaluation, periodic revisions, budget control and making an annual report to the Management team and Board.

The District Resource Teachers would be responsible for developing and implementing inservice and training programs for all staff coordinating integration of technology into curriculum. (Training programs for school clerical staff would be developed in collaboration with the Computer Support Clerk)

...It is important that there be open and constant communication between the Technology Team and the schools and departments it serves. On a regular basis, the Technology Team would seek the advice of a Technology Advisory Committee. Composed of teaching support and administrative staff with expertise in technology, the Committee would function as a source of information and advice about technology issues as well as providing an ongoing forum for the discussion of current and projected needs and initiatives. The Committee would be composed of staff from each school, district based staff and representatives from the business community with expertise in information technology. (S.D. #22)

The fundamental purpose of the acquisition of new technologies is to provide for student achievement, student learning, and student success in the world of work:

Focus on Students

The success of any innovative approach to education must ultimately be judged by the improvement in student learning, and the

102 Heading from the original document.
application of technology in education is no exception.' James L. Poirot (1992)[sic]

It must constantly be emphasized that all educational endeavours begin and end with the question, 'Is this plan focused on students?' Any desire to increase the levels of technological development and understanding in Mission School District are appropriate only as they focus on the development of the student learner and his/her needs in the use and application of technology.

Students must be technologically prepared for the 21st Century; presently they are not! The Technology Committee believes that as the School Board implements its ongoing 'Evergreen Plan', the students of the Mission School District will become more technologically advanced and prepared for the opportunities within the Information Age. (S.D.#75)

Another example of why educators must prepare students (and themselves) for the future:

Although the age of communication is still in its infancy, its effect on society has already been momentous. We are fully immersed in this medium through all aspects of our daily lives; how we access goods, earn our living, communicate with the rest of the world, and manage the marketplace. As the effects of communication on our lives continues to grow at an exceptional rate, it is increasingly important that students and the rest of society learn how to manage this growth in order to yield its potential benefits. The key to this management is through the use of technology.

The role of technology is crucial to success in this area. We are drowning in information, as the sum total of all scientific and technical data doubles every twenty months. Given this growth, information processing skills must be added to the basic skills, where students learn how to access information, how to interpret it, and how to report it.

In order to provide students with an education which enables them to fully participate in the communication age it is essential that they have
access to the tolls needed to manage it. Correspondingly, they must know how to use them and they must have an understanding of the concepts underlying their design. (S.D.#43)

A Contrasting Vision

The following lengthy quotation has been included for its uniqueness among all other provincial district technology plans. Its atypical approach includes a philosophical approach cautioning against the undiscriminating embrace of technology. Written with some reference to academic writings and representing multiple points of view the "vision for the future" is written with "an eye" toward the pedagogical and social effects of the new technologies being introduced throughout the schools of British Columbia. There is a cautionary tone to Mostat's message and as such is representative of the sum and substance of this thesis. There will be those who gain and those who loose. My steadfast resolve is that it not be gender that determines those who loose. Mostat quotes Postman (1993) as follows:

... it is not always clear, at least in the early stages of a technology's intrusion into a culture, who will gain most by it and who will lose most. This is because the changes wrought by technology are subtle if not downright mysterious, one might even say wildly unpredictable ... [but we do know from experience that] new technologies alter the structure of the things we think about... They alter the character of our symbols: the things we think with... And they alter the nature of community: the arena in which thoughts develop.

A Vision for the Future: A Technological Landscape?\textsuperscript{103}

... This seems to be a straight forward, pragmatic approach, which recognizes that updated and

\textsuperscript{103} Heading from the original document. This section of Richmond of Richmond School District's Technology Plan was written by Mr. Bob Mostat, a graduate student of Dr. Suzanne de Castell of Simon Fraser University and a long standing trustee (15 years) trustee of the Richmond School Board at the time of writing the district plan. See Appendix School District #38 Foundations for a complete text.
expanded technological resources hold the potential to improve our lives economically and socially. Put another way, in keeping with the high-tech environments of our homes, recreational activities and work-places, we need to have current technology in our schools, and we all must become "technologically literate". Governments and businesses of all kinds, from local to international, have accepted that "knowledge based" high tech industries are the wave of the future, and have established major policy directions in which information technology is the key to unlock the opportunities yet to emerge.

But should those of us charged with the responsibility for public education accept this vision in its entirety without some reflection? In fact there are a number of voices questioning these perspectives of economic imperative and technological determinism, because they threaten to overshadow what we hold to be central human values.

... The advocates of the increased use of technology in education cite many benefits for students and teachers alike. For students, it is to stimulate interest in learning and the excitement of self learning; to gain a broader knowledge of the outside world: "it's like actually being there"; and to gain marketable information processing skills. Teachers will have access to a world of information to complement their expertise, and have the ability to collaborate with colleagues around the world. As students develop "information literacy", and become "knowledge workers", teachers will assume the role of collaborators and guides to students rather than as an authority simply dispensing knowledge.

Another Point of View

The perspective of these "optimists" might be characterized as a utilitarianism that says that if it works it is good, and if you can do something you should. Others, however, (sometimes called "pessimists" or "luddites") challenge this notion, and pose some questions that perhaps we as educators

104 Heading from the original document.
should consider. These are questions that have more to do with the nature of technology and its relationship to our collective being as social creatures.

... Prescriptive technologies in education are not a recent innovation. Cuban (Teachers and Machines: The Classroom Use of Technology Since 1920) notes that alongside the child-centred reformers such as Dewey, worked the efficiency engineers who brought an enthusiasm for scientific management in their quest for efficiency. Indeed, the foundations of our modern education system are set in the Taylorism of the Industrial Revolution, where the application of control through the "division of labour" was central to the primary policy objectives of effectiveness and efficiency.

Postman (Technopoly: The Surrender of Culture to Technology) comments on the ecological nature of technological innovation, that is, the way in which even small changes can have profound consequences.

Raising consequential issues or questions around the systemic effects of new technologies was definitely an anomaly. Instead district technology plans tended to include descriptions of technology as teaching and learning as the following section will illustrate.

Technology as Teaching and Learning

Mission Statement

Through collaborative leadership and the use of available resources, the Powell River District will provide learners with the opportunities to acquire the knowledge, skills and attitudes necessary to meet the challenges and responsibilities of our complex and changing society.

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105 Heading from the original document.
The theme of this section is teaching and learning. The technology plans often describe the collaborative venture of students and teachers learning together. This point is often a subtle one in that it discreetly enjoins teachers in becoming responsible for acquiring the knowledge, skills and attitudes with which to teach the new technologies. The promised benefits of technology are ever present.

"Learners preparing for the challenges of tomorrow" 

...The most significant impact of technology on education will come from extensive transformation of the curriculum and instructional practice; in Powell River, and elsewhere, this process is known as restructuring. It is recommended that schools use technology based education to make learning more active and interactive for each student. "In order for today's students to compete in tomorrow's world, [sic] to be technologically advanced; capable of using higher-order thinking skills; and able to use conceptual, critical, and applied learning skills."

...Technology brings resources to the classroom that motivate, stimulate and encourage students. It is an integral part of many of today's jobs and will be essential to more in the future. We need a new vision for education that includes changes in what students are learning and how they are learning it, involving students in interdisciplinary work, creating active learners, cooperating on projects and being evaluated using a variety of methods.

The District Technology Committee's task is to help educators make appropriate use of technology to improve instruction. We want to assist in making systemic change in the way instruction is delivered. To accomplish this mission District Technology Committee has five objectives;

1. To review and implement applications of current technology.
2. To implement and support the total technology

106 Heading from the original document.
infrastructure needs of all the schools.
3. To provide teacher/staff training for the effective use of a variety of educational technologies.
4. To assist schools in determining ways technology could be used to reach individual school goals.
5. To develop standards for technology in such areas as infrastructure, equipment and other common elements. (S.D.#47)

Another common feature of the plans in the area of teaching and learning was the articulation of “how” teachers are to “teach” with the technology with “amiable” reminders to teachers that their methodology ought to be current. The inclusion of these reminders might also be directed at the Ministry signaling that the authors of the plans are themselves current. What is absent in all of the plans are authentic references to the Integrated Resource Packages beyond recognition that they exist.

The District's vision is: 107

"To enable students and teachers to use information and communications technologies transparently to facilitate active, cooperative, interdisciplinary, and individualized learning creatively."

The District's vision summarizes a complex approach to education that needs to be elaborated. Information technologies refers to digital equipment such as computers. Communications technologies refers to the telecommunications infrastructure that supports information technologies. In active learning, students assume responsibility for how and what they learn. Cooperative learning enables students to work in groups to achieve shared goals and objectives. Interdisciplinary learning focuses on integrating an arbitrarily segmented curriculum. Individualized learning recognizes the diverse needs and learning

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107 Heading from the original document.
styles of students by freeing them from a constrained, single media curriculum. Critical to the vision is providing inservice, access, and technical support to teachers. This support will facilitate the development of environments that will allow students to creatively construct knowledge for themselves.

The pursuit of this vision requires the continued and expanded use of information and communication technologies to keep pace with the district's evolving educational practice. Through the appropriate use of technology, it is expected that education will continue to evolve from: teachers and students depending on school and community resources to accessing the sum of human knowledge; schools being constrained by its walls and resources to being an access point for students and the community to a world of information; and teachers as front of the classroom instructors to educational facilitators.

To achieve this vision requires the careful allocation of new resources onto existing ones, planning, innovation, experimentation, assessment and revision, and ongoing learning. (S.D.#21)

Questions and "Givens"^108

Although the following text does not question the “value” of the technology initiative there is a minor volley into the political sphere of teachers’ worklives with reference to some of the demands on teachers that have been previously explained earlier in this chapter. Collectively, there is a general acceptance that computers are here to stay because they “support” and are necessary for learning.

Amid all the forces at play in education today in B.C. and worldwide, there are questions and there are givens. One of the questions within current provincial education initiatives remains the true

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^108 Heading from the original document.
nature of the curricular or pedagogical change which will occur. While we move confidently toward a fresh, relevant and learner-focused approach to education, we are still unsure as to the eventual extent of implementation of new models. The uncertainty is based not on questions as to the value of the system currently being implemented, but on issues such as resources, class composition and size, teachers' time to develop and assimilate strategies, and the willingness of public and government to sustain the initiatives.

While we focus our energies on future education issues, something else is growing very quickly within society and within the education system, where the impact is not so much in quantity as in quality ... that issue is the use of Information Technology (IT) to support learning. This is an issue which no longer provides more questions than answers. Computers are a "given"; they are with us and they will continue to grow as a factor in society and education. (S.D.#11)

The differentiation between learning with technology, learning about technology or learning through technology was relatively uncommon. Nevertheless it was common to include one or more than one of the ideas listed under the heading "Key Foci" as justification for pursuing new technologies in preparation for the future.

Mission Statement

Our goal is to support all student and staff learning and success in relation to:

- autonomous and self-directed learning
- lifelong learning
- managing instruction
- making effective use of resources including technology
- adding meaning and quality to learning

Key Foci

109 Heading from the original document.
110 Heading from the original document.
lifelong learners are composed of students, staff, parents, and members of the community
- technology is a means to support and enhance learning
- educational technology has three main emphases:
  1. learning about technology (e.g. technology education, computer studies)
  2. learning with technology (e.g. productivity software, CD ROM resources, cameras)
  3. learning through technology (e.g. Jostens, Pathfinder, Internet) (S.D.#34)

Articulating the Bits & Bytes

Griffin and Cole (1987) argue that in order to address the "parts problem", educators need to abandon the notion that competencies can be hierarchically organized in terms of higher and lower order skills and the notion that each individual child has to master all aspects of a complex task in order to demonstrate competence. Rather the authors "propose to admit many different first level activities into computer use in school" (Griffin and Cole, 1987, p.208) on the assumption that what are usually thought to be lower order skills can serve high order purposes depending on culturally and historically specific contextual conditions. (Bryson & De Castell, 1994, p.214)

A hierarchy of skills and activities was expressed in many plans. Most plan writers chose lists as a means of explaining or presenting the skills that they believe the students should become proficient in and the experiences they believe students should have at school. Categorically, they do not conform to the usual detail found in a scope and sequence charts but for purposes of description they have been called such. A novel example was the following schematic diagram found in School District #88:
Technology in the Curriculum / Technology as the Curriculum

In the example which follows I have taken the textual listings from School District #14 and placed them into a chart format to illustrate the confusion common in the plans. Skills, activities, hardware/software are often interchangeable and undifferentiated concepts. I am of the opinion that there is essentially an inexperience with the technical concepts and experiences which accompany the new technologies. This becomes particularly evident when tangible applications to curriculum and instruction are described. There appears to be an implicit need to demonstrate to the reader that competence and "high order purposes" are being addressed. The chart is also an introduction to the ambivalent relationship between technology in the curriculum and technology as the curriculum which is quite prevalent in the technology plans.
An Example of Scope and Sequence From S.D.#14

<table>
<thead>
<tr>
<th>Primary Years</th>
<th>Intermediate Years</th>
<th>Graduation Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>writing, editing, publishing</td>
<td>writing and editing individual reports</td>
<td>individualized programs of learning</td>
</tr>
<tr>
<td>contour and continuous line</td>
<td>keyboarding skills</td>
<td>use of computer-mediated expert systems</td>
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<tr>
<td>drawings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>science simulations</td>
<td>business applications</td>
<td>business applications</td>
</tr>
<tr>
<td>problem-solving and</td>
<td>computer assisted instruction</td>
<td>information management</td>
</tr>
<tr>
<td>decision-making software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>number operations</td>
<td>information management</td>
<td>personal/career resumes and covering letters</td>
</tr>
<tr>
<td>video overlay for</td>
<td>graphic representation and design</td>
<td>experience with computers in the workplace</td>
</tr>
<tr>
<td>presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>making rhythmic and melodic</td>
<td>electronic encyclopedia or other reference</td>
<td>programming</td>
</tr>
<tr>
<td>patterns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>composing music</td>
<td>access to information and the ability to</td>
<td>computer aided design</td>
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<tr>
<td></td>
<td>communicate globally</td>
<td></td>
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<tr>
<td>applications as graphics</td>
<td>reading and graphing data</td>
<td>simulations in electronics and automotive</td>
</tr>
<tr>
<td>and telecommunications</td>
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<tr>
<td>electronic encyclopedia or other</td>
<td>simulations</td>
<td>diagnostics in electronics and automotive</td>
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<td>reference</td>
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<tr>
<td>reading</td>
<td>problem-solving and decision-making software</td>
<td>interfacing tools to computers</td>
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<td></td>
<td>experience</td>
<td></td>
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<tr>
<td>music composition</td>
<td></td>
<td>computer controlled laser, communications and robotics</td>
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<td>school newspaper publishing</td>
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<td>subject specific applications</td>
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<td>career planning software</td>
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<td>information management</td>
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<td>multimedia presentation</td>
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<td>interactive video</td>
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Fig. 3.8

Another common element of the plans is the expression of “enthusiasm” or “excitement” toward the “promised” possibilities engendered by embracing
technology. The accompanying language is often such that the reader is not always sure whether the "present" is being depicted or the "future" delineated for an unspecified audience. A further commonality in the plans is the placing of subjects/courses, designated brand name software, and specific computer platforms in the curriculum section of the plans. In addition, the following segments are once again illustrative of the technology in the curriculum or the technology as the curriculum confusion. Teachers and students appear to lose their individuality. The variation in their skills, talents and ability is lost; they become generic entities who use (or ought to be using) computers in the following ways:

Curriculum/Teaching/Learning

ii) Intermediate:
Teachers at the Intermediate level have developed new applications and functions with the technology tools provided. Teachers use technology tools to plan, to generate assessment and testing instruments, to write anecdotal report cards, to collect statistics and data on student achievement and, to research and publish. Teachers are using the technology tools to communicate with parents, other teachers and with the community at large. Teachers are beginning to consider and develop applications using telecommunications and we foresee tremendous growth in this area with initiatives underway at all levels to link and connect schools and learners to the global information system.

Intermediate students are utilizing computer technology in a variety of ways. Each day in our school district students are both acquiring and using technology skills in the following ways: keyboarding utilizing software such as Mavis Beacon, Almena word processing using Microsoft Works, Word Perfect Children's Writing and Publishing and others.

111 Heading from the original document.
• desktop applications using Microsoft Publisher, Print Shop Deluxe, Certificate Maker, Publish It.
• learning software in mathematics science, language arts, EduQuest, social studies.
• exploration and discovery learning software which encourages and nurtures thinking and reasoning skills.
• fine arts applications include some applications like Paint and Draw programs and desktop programs.
(S.D.#9)

The next example appeared in two separate plans. The language used to describe the essential learning outcomes suggests a new terminology /jargon is being coined to describe the skills required to participate in the technology. This language is not restricted to one or two plans but is evident throughout all of the plans. Whether or not it is adapted from the broader computer culture or characteristic of “educational speak”, I will leave the reader to judge. Nevertheless, I wish to make the point that it is the technology which is credited with determining the need for “new roles in learning, living and working” and it is the teachers who are likely the intended audience and their message is to begin “systematically” teaching the following learnings:

Seven Essential Learnings for Technology

The above three basic Principles of Learning act

112 Of course, when one considers Franklin’s conceptualization of technology it becomes more transparent that it is not the technology driving the system.
113 Heading from the original document.
114 The Principles of Learning are found in the Legacy for Learners from the Sullivan Royal Commission (1988) and appear in each of the Integrated Resource Packages. They are: 1. Learning requires the active participation of the learner. 2. People learn in a variety of ways
as the foundation for more specific approaches which would promote the effective use of technology. The following seven essential learnings for technology, if systematically applied, would require learners to develop new roles in learning, living and working:

1. The learner as information navigator.
2. The learner as critical thinker and analyzer using technology and telecommunications.
3. The learner as creator of knowledge using technology and telecommunications.
4. The learner as effective communicator through a variety of appropriate technologies / media.
5. The learner as a discriminating selector of appropriate technology for specific purposes.
6. The learner as a technician.
7. The learner as a responsible citizen, worker, learner, community member and family member in a technological age.

(S.D.#17)

Curriculum Clarification

The following textual fragment demonstrates a mindful and explicit delineation of how and where technology ought\textsuperscript{115} to be integrated into the curriculum. The full text\textsuperscript{116} contains parallel information specific to each of the disciplines and/or subject areas. This specificity is not common in the plans, however, the concept of curriculum-specific use and skills is. In light of earlier findings in this chapter, in the area of gender and course selection, there is evidence to warrant that caution be exercised when choosing the curricular areas for technology integration. I would suggest that it be something more

\textsuperscript{115} I am experiencing some difficulty with choosing the verb in this sentence. Where I have placed “ought” perhaps a better choice might be “could”. This struggle is indicative of a generalization that is forming as I analyze the plans. I cannot help but think that there is an implicit message; one that is becoming more and more explicit as I proceed and that is teachers are being pressured through “subtle directives” to change/ update their teaching practices and incorporate technology into their programs.

\textsuperscript{116} See Appendix School District #11 Agent of Change for the full text.
tangible than the call for caution lest the same gendered patterns be recreated and further entrenched. The scope and sequence chart introduced earlier in this chapter from School District #14 is also illustrative of this point. In the graduation years portion of the chart it uses examples such as computer aided design; simulations in electronics and automotive; diagnostics in electronics and automotive; interfacing tools to computers; and computer controlled laser, communications and robotics. These are the courses where less 5% of the instructors are female and less than 20% of the students are female.

1.1 Math/Science

In the next few years, the everyday experiences of a Math/Science student are expected to go through an evolutionary process that will reflect the changes prescribed in the new curriculum, the developments in technology, as well as the revolutionary changes taking place in the way that research is being done in scientific laboratories around the world.

The number crunching, laborious measurement taking and graph or model generation will shift increasingly to machines that may be as simple as a handheld calculator or as complex as a computer that can create sophisticated simulations. Students will be less dependent upon teachers as mainsprings of knowledge and managers of their education and more likely to be travelling unique paths through a series of educational experiences. These unique paths will be dependent on student interests, aptitudes and learning rates. In such an environment, technology will be able to provide students with individualized learning activities appropriate for their skill and interest level at a given time. ...

117 Heading from the original document.
118 Commentary such as this appears rational at the outset. One has to look more closely to determine if it is being used as a means to deny access to those who for reasons other than the illusive “aptitude” and “interest” are not welcomed.
Students will turn to computers for computer assisted or managed learning. The computer instruction will be interactive and responsive to the rate of student learning. Topics might be as narrow as estimation with metric measurement or as expansive as beginner's calculus. The computer will provide students with the opportunity to address data analysis in an efficient and meaningful way...

Math & Science teachers are finding computers linked to Overhead Projector Monitors invaluable instructional aids. The whole class can share in the derivation of a solution, a simulation or the testing of hypotheses. It has become an efficient vehicle for pooling class data such that a large group can gather information, collate that data and collectively examine it for relationships in only a fraction of the time that individuals could do so. The multimedia dimension has empowered many teachers to bring a more complete and enriching experience before students addressing the need for more multisensory learning. (S.D.#11)

Moving from the specificity of the previous examples to the generality of the following texts, the means by which the district plans dealt with the Ministry's requirement that technology plans be linked to curriculum implementation provide a glimpse of the variation between plans. This particular requirement proved not to command the space and focused attention that hardware acquisition and networking plans were afforded. Yet curriculum is the sum and substance of what happens in schools. Or is it?

Linking Technology Plan to Curriculum Implementation\textsuperscript{119}

All staff strongly indicated the need for support in the areas of telecommunications and how to integrate computer and information technology skills into the curriculum. Telecommunication services will enable staff and students to

\textsuperscript{119} Heading from the original document.
collaborate, access and exchange information locally, provincially, and globally. This will allow staff and students exciting opportunities for personalized learning and the ability to integrate curriculum with information technology. A scope and sequence K-9 has recently been developed to enable teachers to link technology to curriculum. It is being made available to the schools and will be evaluated within the next few months. Integrated Resource Package's (IRP) provide teachers with teaching and assessment strategies to effectively use technology in instruction and monitoring student achievement. (S.D.#22)

This particular example recognizes new curriculum to be implemented and accredits the acquiring of “technical resources” from the Integrated Resource Packages as supporting the new curriculum. Beyond vague “support” and “intent” to implement there is little detail as to how this might be made to happen for teachers. I will pursue the topic of inservice in greater detail in the section “Technology as a Tool for Change”. Another example of the intermixing of teacher applications (e.g. Primary Reporting, S.D. #2) and computer assisted instruction (e.g. Bridges, S.D.#2) as curriculum priorities is also quite common. The combination of applications, curriculum, applied to either teacher and/or student is commonly placed under the headings of curriculum or inservice in the plans.

Meeting current curriculum priorities is recognized as a major goal in our district. We intend to support the recommended technical curriculum resources found in the current Integrated Resource Packages. We have developed a Primary Reporting procedure that takes advantage of technology and will have in place by the Fall term a similar Intermediate Reporting procedure.

We intend to implement in the Fall of 95 the "Bridges" program to support the Career and Personal Planning curriculum at the secondary

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120 Bridges is marketed as a student resource for the Career and Personal Planning Integrated Resource Package.
Establishing Curriculum Priorities

Found under the heading, "Curriculum Implementation Priorities", is another example of the confusion that exists around the concept of curriculum. Machine, platform, staffing, course listings and promises are all placed under this heading. Once again it is difficult to determine whether the study of technology is the curriculum or the technology is the support to existing curriculum and practices.

A key goal of the district technology/business plan has been to introduce a business/computer department to the secondary school using MS-DOS technology thus providing all students with a good grounding in both operating systems prior to graduation as well as access to a broad array of technology courses.

This goal was met in September, 1995 with the addition of a business/computer teacher to the secondary school staff and the installation of a 24 workstation Pentium Lab.

Newly offered courses in the district are Keyboarding 8, Business/Computers 9, Keyboarding 9/11, Data Processing 10/11, Accounting 11, Information Management 11, Data Processing 12, Accounting 12 and Business Management 12.121

The district has also introduced a Career and Personal Planning Centre with Pentium CD-ROM workstations offering both the Choices and Bridges Career Exploration Programs.

The introduction of technology to regular classroom teachers has been identified as a primary in-service priority in keeping with the demands and

121 Again evidence is presented that course offerings may determine who receives technology training and the type of technology training they receive.
The successful implementation of curriculum goals lies not just in teaching these goals as a separate subject, but in using them to enhance and ease student acquisition of learning outcomes in all curricular areas. For example, Business Education or Technology teachers and Teacher-Librarians may consider working on cross-curricular projects.

District #76 will assist in the successful curriculum implementation of the Technology Plan by:

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122 Heading from the original document.
identifying and supporting school based resource persons (e.g., time allocations, technical resources and training opportunities)

- encouraging and supporting teachers in identifying their individual strengths, interests and needs

- continually developing and monitoring both school and district goals of technology implementation and its related teacher in-service

- developing and communicating strategies to support teachers prior to and during implementation of new IRP-based curriculums, particularly as related to information technology

- promoting a climate of risk-taking for teachers to explore a variety of approaches and teaching strategies to incorporate essential information technology skills

- providing appropriate assistance technologies to students with special needs

Note that the general goals for students follow closely after the district has explained how they will identify, support, promote, encourage and communicate with teachers to implement curriculum in all subject areas. In other words it is plausible that all teachers are being “put on notice” that there is an expectation that they become familiar with new technologies.

**Curriculum:**

The general goals, listed below, cover all subject areas. The students will be able to:

- use an expanding variety of information technology tools, applications, and production processes
- apply problem solving skills to meet information needs
- learn how to manage resources and information

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123 Heading from the original document.
Technology as a Tool for Change

Technology is a tool that can increase the motivation of students, enhance collaboration between students and teachers, decrease behavior problems, provide more time on task, and address different learning styles of students. Technology will not replace teachers, however, it may change the teacher's role. It should become a teaching tool that improves efficiency in learning by supporting and enhancing basic skills instruction, critical thinking and problem solving skills, logical thinking, higher-order thought processes, and learning in content areas....(S.D.#47)

The preceding text reminded me of Bryson and De Castell's (1994) quotation from Hilary Lawson (1989): “All our truths are, in a sense, fictions— they are stories we choose to believe.” The above text is an example of a “familiar story” heard each time there is a new innovation in education. The narratives embedded within the plans charge the technology with agency at the same time as describing it as a tool. As the transformational tales are told the narrators employ an “authorized language”, “prescribed” from the pages of curriculum documents. In their zealotry caution is neglected and the possibilities of negative consequences of human/machine impact are forgotten.

Agent of Change

Educational uses of computers can be said to be entering a fourth era, one which promises to make

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124 Heading from the original document. See the Appendix School District #11 for the complete text.
a lasting impact on curriculum and instruction. These eras correspond roughly to the 1970s, the early and late 1980s, and the 1990s. ...

The 1990s - The Computer as an Agent of Curriculum Change: Educational experiences had been enhanced in the 1980s by using the computer as a tool. While we mustn't discard the extremely valuable "tool" nature of good computer software, we must address the fact that curricular experiences will be fundamentally charged in the coming years based on what computers can now do. Curriculum and delivery will be personalized by "computer managed learning'. Curriculum will be written or rewritten around the strengths of good software environments (paricularly [sic] in math and science), and expectations of students will change in light of research, writing and publishing capabilities of technology. Multimedia and optical technologies will play a central role, as will record management systems which allow teachers, students and parents to interact freely. (S.D.#11)

This next example places technology under the heading of a philosophy. Guidelines come in many forms in the plans. Some are present under headings such as missions, visions, and goals. Their intent appears to be instructive, educative or conceivably, indoctrinating. Their themes rarely deviate from those following:

**Philosophy**

School District #10 has adopted the following guidelines concerning the use of computer technology:

- computer technology is a tool;
- computers have the potential to shift roles and redefine jobs;
- computer technology changes continuously, requiring a commitment to life long learning by staff and students alike;

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125 Heading from the original document.
• computer technology must be used equitably among all users; there must be equitable access to all resources (hardware, software, Internet, etc.);
• networking is a major long term goal (networking not only within the school, but within the district, the province and the global community);
• commitment to provide the most appropriate tools to individuals and to ensure that these tools assist individuals complete their tasks efficiently, with appropriate support and assistance. (S.D. #10)

Technology Is Efficiency and Deliverables

The last guideline in the above example is a common justification for introducing new technologies. Technology is about becoming more productive, more efficient and cost effective. Teacher and student alike are included in this predilection. More creativity, increased academic performance and improved instruction are delivered as a result of embracing technology. This is illustrated in the following examples.126

'The Langley School District will cultivate an environment in which the use of information technology will expand the learning opportunities of its students, support them in achieving the values outlined in the Graduate Profile, and towards the same end, enhance the productivity and creativity of its employees.' (S.D.#35)

As we approach the 21st century and restructuring becomes a major factor, educators must incorporate new technology into the instructional program and continually adapt methodology to ever emerging technology. In short we must become more effective and at the same time more efficient.

It is within these parameters that we have

126 For other examples of the deliverables and efficiencies predicted through the use of technology see Appendix Examples of Technology as Efficiency & Deliverables.
developed this productivity plan for Powell River Schools.

The major objective of this plan is to offer solutions that will:

- Give teachers the tools and information needed to teach, given the diverse skills of students
- Improve the quality of instruction
- Enhance the delivery of Instruction
- Increase student academic performance
- Motivate, stimulate and engage students in the learning process
- Equip students with the technology related skills needed to function and compete in the world of work and institutions of higher learning
- Improve efficiency, effectiveness and increase productivity of students and district personnel...(S.D.#47)

**Inservice Delivery Models**

In Fullan's *The New Meaning of Educational Change*, Chapter Three begins with the following quote: “If there is no meaning in it, that saves a world of trouble, you know, as we needn’t try to find any.” (Fullan, 1991, p.30) When the Ministry of Education requested an “outline of a teacher training and support program designed to enable all teachers to integrate technology into their classroom learning environment” in the requirements for technology funding, the abyss of [im]possibilities broadened with this sparse request. Inservice, teacher training, professional development, and teacher support, the costly campaign promises of innovation and initiatives, are the foundational structures upon which educational change rests. They are also the most neglected facet of all innovations. Educational change or educational innovation is multidimensional, “involving changes in skills, practice, and theory or conceptions.” (Joyce and Showers, 1988 as referenced in Fullan, 1991, p. 40) The addition of computer technology to the schools is just such a multidimensional innovation and affects people’s "occupational
identity, sense of competence and self-concept.” (Fullan, 1991, p. 40) When the pressure for technology implementation is added to the mix of curriculum implementation priorities with the current inundation of new curriculum in all subjects at all levels in the K-12 education system, the possibilities of the system to handle this change without visible, viable and systemic support are daunting especially to those individuals who are asked to make the changes in their classrooms. This next section deals with the some of the themes that appeared as districts grappled with including professional development in their plans.

It is well accepted that some form of inservice or training is needed in order for teachers to use the new technologies and incorporate new activities employing these technologies into their instructional programs. What remains illusive is how to lure “busy” individuals into giving their time to this one particular “cause” in a cast of many.

“Developing a Competent Flock of Soarers”

“If you build it they will come” does not necessarily apply in education, especially when technology and change is concerned.

Without the Board's support of a training program teachers may avoid the computer lab like the plague. This is why School District #13 hoped to build a system of intense inservice; to support teachers in learning how to teach by making use of the new technology and then to assist students.

The inservice program devised for S.D.#13 will include technology inservice for all levels of users. By starting with the basic operating of computers we hope to introduce staff to our systems and software why the world around us has changed and that the methods of delivering education MUST [sic] change in accordance. To do this we have and will continue to offer inservice that starts at the very elementary steps.

We will offer introductory hands on instruction on how to use CLN. We will attempt to assist with
classroom instruction of students by modeling classrooms lessons. As well, School District #13 intends to train our trainers on more advanced technological methods so in turn these local trainers can work with our teachers.

The district's Staff Development plan will provide numerous workshops and inservices on technology. (S.D.#13)

The general nature of the commitment is sketchy as is the relationship between the curriculum, the technology and how the inservice/training will impact on the two. They appear as separate entities in district plans. The Ministry's requirement for an outline in the area of professional development is in and of itself an admission of a perhaps perfunctory request. By and large the responses of the districts were in many ways similar to their responses in curriculum. Many submitted lists of workshops that they had given in the past, were thinking of giving in the present and planning on giving in the future. The particulars about the workshops often included specific software programs or mentions of general word processing, database or spreadsheet applications. There were few districts who were quite detailed in presenting their ideas and then there were those who offered little else but promises.

Implementation and Support
Implementation is much more than putting various technologies into schools, it also means an inservice program which encourages leaders and all teachers to implement computer-use strategies. Without inservice and strong peer leadership such a plan may remain in the domain of the few rather than the expectation for all students and all teachers. Implementation includes many critical issues as: personnel and in-service, hardware and software, and maintenance, repair and replacement.

127 See Appendix School District #57 Staff Development for an example of a detailed plan.
Implementation and support are quite different concepts. The first involves learning new curriculum and instructional strategies which often accompany the innovation whereas the support refers to technical support in the areas of software and hardware maintenance. Both of these areas are highly critical adjuncts which involve teachers risking the “safety” of their working environments. Most districts recognize the importance of these two areas but offer different solutions as to how they will deal with them. For example: the following text identifies what teachers require; time, lesson plans, instruction, models and so on.

Personnel and In-service

- Perhaps the key element in moving toward such an educational environment is the teacher.
- Teachers must have instruction on the use of software packages, and time to explore and experiment with emerging technologies.
- Beyond instruction, teachers will need to have access to thoughtful lesson plans which integrate technology into various curricular areas, as well as have the opportunity to see other teachers model various methodologies and teaching styles.
- assessment and reporting strategies and software
- lesson and curriculum management
- individual productivity tool for preparing assignments or handouts
- demonstrations and multimedia presentations
- electronic messaging for professional consultation and discussion (S.D.#14)

The support issue is usually resolved by hiring technicians. Alongside the technician a computer co-ordinator with technician-like skills is also recommended. This individual is often assigned curriculum and training
responsibilities. The skills and expertise of "individuals" begin to be crafted for public consumption.

Support Service: District:

• To support the implementation of the technology plan, current roles need to be maintained and reviewed on an annual basis. These include:
  1. A full time computer/audio visual technician and
  2. A 0.1 f.t.e. computer curriculum advisor and trouble shooter.
• As equipment ages, the need for repair and replacement will increase at the same time, we will be moving towards curriculum integration of computers with in the classroom.

Expertise Needed

In light of the preceding quotations I believe Ursula Franklin provides cause for reflection in light of the changes being induced and promised by new technologies. "It is normal for any society to evolve social institutions and to structure its social activities so that the power and control of the structuring authority is maintained and advanced.” (Franklin, 1990, p.58) District level expertise and school level expertise begin to take on a recognizable hierarchical appearance. One that compares to the traditional hierarchy previously identified in the literature review. Males would likely have the specialized computer technology positions at both district and school levels.

District plans tend to include references to job positions meant to assist with the implementation of computer/information technology. Job descriptions, albeit not as detailed as the following, are also not uncommon:

Coordinator Of Technology¹²⁸

Core Function:
The Coordinator of Technology is responsible for the management, development, implementation,
and training related to technology, data processing, and electronic communication for both curricular and administrative applications in the District.

Facilitator - Computer Support Services

Core Function:
This is a Position of Special Responsibility as defined by the NVTA Collective Agreement. The Facilitator Computer Support Services provides support to the district’s teachers in relation to using technology to enhance curriculum delivery. (S.D. #44)

Whereas school-based support is not necessarily articulated in as much detail when it is included descriptive “suggestions” of how “interested volunteers” or site-based experts can assist teachers in the schools with technical and instructional problems associated with technology:

School-based Support

The increased use of technology at the school level makes the need for on-site technology support for teachers and students a necessity. Identified individuals will work closely with school staff, students and the administrative officers to develop a framework of support (training and in-service, troubleshooting, teaching students specific skills etc.)

This position would be recognized in a fashion similar to the department heads. Something as pervasive across the curriculum as technology demands continuous support.

- The primary role of school based support is to provide leadership in curriculum integration using technology. (S.D. #14)

Whose Responsibility?

Descriptions of roles and responsibilities for district and school-based expertise suggest potentially acrimonious and politicized questions: Whose

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129 Heading from the original document.
130 Heading from the original document.
131 Full job description is in the Appendix School District #44 Background
responsibility is it to teach the teachers? How are practicing teachers to become familiar and proficient with new technologies? When is this training to take place? Who is responsible? Seeking definitive answers to these controversial and contentious questions in a public forum without formal management and union representation would not be considered de rigueur.

Yet the texts of the technology plans do offer some glimpses as to how districts are thinking about this issue. Before citing examples from the plans the following item taken from the British Columbia Teachers' Federation Professional Development Issues Listserv places the issue of inservice and training into a broader context: "Public sector spending on training and development is "abysmally low" compared to the national average, according to recent survey conducted by Jean-Pascal Souque for the Conference Board of Canada."132 Although the call for targeted government funding does not appear in the district technology plans the fact that the training and inservice of teachers is not covered under the Technology Fund should be duly emphasized. Ministry funding is to be used to purchase hardware, software and information services. The funding for training teachers is to come from diminishing district budgets.

132 The following excerpt is from an article titled "Underfinanced Public Sector Seeks Training Solutions Close To Home' in Learning In The Workplace magazine (a supplement to the Canadian HR Reporter Newsmagazine).

"That's a horror story," said Soque, referring to the low spending figures, particularly in health and education.

Companies in Canada spend about $840 per employee per year on training and development, according to the survey. The health sector spends on average "around $450, and education around $300," said Soque. "That's really pathetic."

"I'm trying to figure out why education-a multi-billion-dollar business in Canada-spends so little in the professional development of (its) people because those are really critical positions...to develop good citizens you need the best possible teachers, at the same time you've got to prepare the kids for the world of work and lifelong learning," said Souque. "] How do you train kids for lifelong learning when the teachers aren't into the culture of lifelong learning themselves?"(February 25, 1997)

133 In Spring of 1997 many school districts had budget shortfalls which necessitated the laying off of staff as well as other substantial cutbacks. How technology acquisition and teacher training will fare as a result of this situation is anyone's guess. It would make an
Many districts were “proud” of their Computer Purchase Plans. These plans enable the teacher to purchase a computer through the district with payroll deductions and no interest loans.

For the past 6 years we have offered an employee computer purchase plan which allows employees to purchase computers at substantially reduced rates and spread the payments over 9 months with the District picking up the interest charge. This has seen over 750 computer systems purchased by District employees since 1989/90, and in part explains why the District Technology Program has progressed as rapidly as it has(S.D.#23)

The following text offers reasons as to why the payroll deduction plan is good for the district. The reasons are familiar ones:

Staff development in education technology begins with helping individual teachers become computer users in their daily lives. The skills and interests they develop become the foundation for the work they do with students and computers. To do this effectively, the District must facilitate teacher purchase of personal computers and teacher access to computers in their workplace. To facilitate the purchase of personal computer for teachers, the District will work towards enhancing the computer purchase plan for teachers. This is the best investment the District can make in teacher inservice at a minimal cost to the district. The District recognizes that allocating computers to teachers as well as students enhances the educational services of a school. (S.D.#55)

Another example of the payroll deduction plan. The contribution of $1500 is, I believe, temporary. It requires that the teacher put a sum of money forward before the district will enter into the agreement for the payroll deduction. I surmise this because few computer systems would have a cost of only $1500.

interesting follow-up to this study to determine the distribution of the actual dollars and how they relate to technology acquisition, curriculum support and teacher training.,
...contributing up to $1,500 towards a staff member's new computer purchase or computer upgrade, providing computers to staff up front and staff members purchase the computer through payroll deductions, collaborating with a computer supplier and lease computers to staff members via payroll deductions, providing staff with an interest free loan to purchase a computer. (S.D.#64)

The following plan is an anomaly in that it overtly locates reasons for difficulties encountered in bringing about computer competency in teachers. Because it openly states what others have, I believe, implied in their texts through instructional and inspirational prose I have chosen to include it. It locates the blame on antiquated hardware, lab placement of computers and aging teachers who have not kept up with the times. This is the only example which is so direct in its approach. It was prepared by two individuals and the District Technology Committee. It begins with an appreciative tone:

Golden School District appreciates the challenges that our teachers and support staff face with the appearance of unfamiliar computer hardware and software in the schools and how, in general, the staff have worked toward becoming technologically comfortable. However, comfort is not enough. Staff have struggled to go beyond the comfort level in order to develop strategies for curriculum based utilization. It has not been an easy job and not all staff are at this level of utilization. Minimal in-service has been available. Our teachers' skill level is still not conducive to the proper implementation of proposed new curricula and technology based instruction.

Like most school districts, it has been increasingly frustrating at times as usage and increased demands and expectations have taken their tolls on existing equipment. Wear and tear on equipment and minor and major glitches related to novice use have, on occasion, left teachers with a class in the lab with equipment that is not working properly. At the same time, the speed at which the upgrades and new generations of computers enter the marketplace handicaps school districts [sic] as soon as a purchase is made. These factors have left the
highschool , in particular, without a significant upgrade for six years. Simultaneously, the expectation of computer labs as opposed to computer pods has used badly needed classroom space while hampering curriculum based instruction utilizing computers. Each of these issues was of considerable concern to the District Technology Committee. (S.D.#18)

Personally, I find the following text difficult to accept as it sets its authors apart from the “aging staff” for the authors place themselves as knowing better than the “common folk”. They take the position that a set of objectives for students, teachers, schools and district will inspire their colleagues to understand that a computer is more than a typewriter:

Along with the aforementioned issues, limited professional development activities related to technology has restricted computer assisted instruction. Not that the availability alone has been an inservice problem. Aging staff who see computers as just a fancy typewriter, has also squelched student access to a technologically literate world. To this end the District Technology Committee first addressed the vision of computer assisted instruction through the development of a set of objectives for students, teachers, schools and district. [S.D.#18]

The following text from the School District #39 (Vancouver) contains most of the examples of inservice and staff development options that were included in the district technology plans. The initial heading “Professional Growth Options” situates the responsibility for professional growth at the feet of the teacher by offering online courses, video based instruction and self-directed learning. Although these options may appeal to some, by and large, they are extremely difficult to fit into already busy schedules especially if those schedules belong to women with families or aging parents. Most of the following suggestions appear to be offered in personal time rather that work time placing, the onus on the individuals to attend voluntarily on their own
time. The appeal of practitioners, who include minimal references to theory, providing the inservice is often well received by teachers.\textsuperscript{134}

Professional Growth Options\textsuperscript{135}

To address these obstacles, the Vancouver School Board provides support to teachers in a variety of ways (see \textit{Developing a Professional Growth Plan for IT} in appendix). Typically, professional development mainly consists of a onetime workshop.

The Professional Growth Options approach takes into account a variety of methods to support individual learning styles. To support self-directed learning, reading lists, online courses and video based instruction are available to assist teachers. Opportunities for site visits and peer coaching are available to support mentoring and modeling good instructional practices. Vancouver teachers can also participate in curriculum and resource development projects which enrich their understanding of both the principles and tools of teaching with technology. In-service workshops at the District Technology Centre provide theory, demonstration and practice of new skills. All lessons are taught by classroom teachers who actually practice what they teach. Inquiry groups also meet to bridge the gap between theory and practice. In addition, the district provides opportunities for networking through user groups, online forums and meetings with outside groups. (S.D.#39)

Other models mentioned in the district technology plans include peer tutoring, student and parent helpers, site based experts, pilot projects, special days set aside for informal drop-in sessions (e.g. Mac Mondays), specific district professional days and university, college or night school courses. The possibilities are many, but the responsibility for attending in

\textsuperscript{134} This particular aside has been arrived at from personal experience. Teachers are often intolerant of theory in workshops. They are more comfortable with practical activities which can be used in class without much preparation.
one's own time, remains at the individual's discretion. Neither individual nor employer responsibilities are differentiated in the plans. Despite detailed explanations extolling the virtues of professional development and long lists of technological competencies, district technology plans have only informal structures in place for assisting teachers in incorporating technology into their programs. Some districts have tried to factor in the cost of training specific individuals in schools and having them deliver training at the school level.

The following "workshop in a box" or "train the trainer" idea is one example suggested for minimizing the cost of training teachers:

This year we are developing a Train the Trainer Program where schools send 2 or 3 staff members. At our trainer workshops, teachers are provided with overhead transparencies, templates on disk, project worksheets, and trouble-shooting checklists. Follow-up support is provided through user group meetings, peer coaching, and information on teaching adult learners. (S.D.#39)

Many variations of the model are also suggested:

- individual schools should set aside 20% of school-based professional development funds to support teacher training using technology.

- that the District assist school principals in identifying school based resource people, and then utilize the ITC to provide the proper support to develop these "trainers of trainers". These trainers will then be responsible for delivering inservice to their own school staffs, as well as acting as resources for other schools when needed.

- that the District provide each teacher trainer with access to a productivity computer.

- that the District establish an "incentive" inservice program for teachers. (S.D.#34)

135 Heading from the original document.
Equity

The question of equity

In a workplace of increasing technological dependence, the differences between those who thrive in the aforementioned environment and those who do not are becoming greater. Successful ventures are very often found in small businesses and entrepreneurships which are able to adapt more quickly to changing technologies. Individuals who are able to adapt quickly to new environments will also be at an advantage. (S.D.#70)

The juxtaposition of the preceding text has been included to demonstrate the disparity in the use of the term equity. In the British Columbia school system in the years from 1989-1997, a conscious choice has been made between the term “equity” and “equality”. This choice of terms has in and of itself implications that were mostly overlooked by the majority of the plans. The terms were frequently used interchangeably. Only a handful of districts signaled they were mindful of the difference between the terms. Fewer still, referred to the Ministry’s policy concerning “equity” overtly. And then there were the few who created their own terminology, “equitability”, a term which does not appear in the dictionary and whose meaning is subject to speculation. The association of the term, gender equity with technology was rare. With the exception of School District #38, there were no direct

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136 The term first appeared in documents after the Sullivan Commission. The Ministry of Education at the time promised curriculum changes that included: “an integrated, learner-focused and common curriculum, organized around the four strands of humanities, sciences, practical arts, and fine arts, and based upon a principle of gender equity. Student streaming was rejected, and 20% of the curriculum was to be locally determined.” (Brummet, 1989, as quoted in Werner, 1991, p.227)

137 To ensure equitable access to educational technology throughout the district (S.D.#81)

138 Although the definition of gender equity is included in the district’s technology plan the term “gender” was deliberately dropped from the initial definition when it appeared in the plan. This was done so because of objection from a number of respondents to the plan. Rather than amend the foundation principles this adjustment was made. The principles
references to the Ministry's policy on gender equity beyond the inclusion of the terminology. For the purposes of this thesis and the following analysis I have used the Ministry's definition cited previously in Chapter Two. For simplicity, I include Landis's terse definition "equality refers to sameness [and] equity refers instead to fairness and freedom from bias and favouritism" (Landis, 1995, p.11 In the Appendix I have listed all references to the term "equity" that appeared in the district technology plans. I have placed the use of the term into three categories: Equity: the Status Quo; Equity: Conflicting Concepts; and Equity: Approaching A Definition in Policy.

Equity: The Status Quo

Approximately 29 districts used some form of the word equity. Others did not use the term at all even when addressing the Ministry's requirement to address "equitable distribution of education technologies within the District." The choice of language in this requirement did not inspire policymakers to consider the conceptual implications of equity beyond "equitable access" to hardware. The association of technology with identified and documented gender inequities embedded in the education system is absent. The association of technology with identified and documented social inequities in the broader culture is also absent. The "enduring purposes" or social

remained. I have to admit that carrying these principles forward into action has been incredibly difficult and often results in "squirmishes". As I will later state in the final chapter I do not believe that equity is possible unless someone is given the "authority" to prescribe outcomes.

At this point I would like to add an aside that has not been factored into the general theme of the paper but has been most noticeable when reading the district technology plans. The plans have very few references to resources beyond a few Ministry documents such as PACET or Technology in British Columbia School: Report and Action 1995 to 2000. With few exceptions there is little evidence to demonstrate that "policymakers" researched the topic of technology beyond their personal experiences. A theoretical grounding and broad understanding of the implications of technology are not generally demonstrated. Personally, this finding is one that I have some difficulty with from two perspectives. The Ministry has not offered leadership beyond politicized announcements and bureaucratic requirements to a major initiative. As educators I am of the opinion that we have an ethical responsibility to
responsibilities of education appear to be overlooked by most of the technology plan policymakers.

By and large there is a common belief that it is access to networked computers that will achieve equity.

Equity will be achieved by consistent development of the following:
1. networking of the computers in each of the schools.
2. connecting all schools to the Internet.
3. purchasing computers needed to achieve Ministry guidelines.
4. staff development
5. policy re: equity of access for all students and staff. [S.D.#1]

Another common area that districts saw as important to deal with in terms of equity was the large versus small school issue and the have versus have not schools. The “fair and equitable” distribution of money was often highlighted.

We also recognize that our small schools must receive special attention with regard to the allocation of funds in view of their limited capacity to raise financial support. Equity and access are paramount....Our plan strives to bring together financial support from all sources in order to maintain equity/fairness and accessibility in the system.(S.D.#7)

The “promise” of “fair, consistent and equitable” practices are also brought out in the plans. Missing are the details. Faith, in established or about to be established processes and procedures, appears to be important. Paralleling the distribution of equitable funding sources a great deal of attention was spent in identifying similar equitable distribution of computers

be informed of the possible “consequences” that may attend uninformed implementation of innovations that have potential social consequences. It would appear to me that some informative literature ought to be distributed to at least inspire some discussion in the “boardrooms” of the “policymakers.” Evidence of this type of interaction was generally absent with the exception of School District #38.
throughout individual schools with districts. This was often justified with charts specifying numeric details of age, type, operating speed etc.

Supplies, replacement equipment, learning resources, in fact all resource areas are distributed between schools according to carefully determined allocation formulas. These formulas vary according to resource and year, but are always worked out at the committee level in a manner which is fair, consistent, and equitable. (S.D. #16)

Equitable distribution of education technologies within the district and a multi-year funding commitment. The “background” statement outlined above indicates that the District has already made a substantial and equitable long term commitment to the use of technology at both the elementary and secondary levels. Over the course of the past five years, the District has spent close to $4,300,000 for educational and administrative technology initiatives (this figure is for hardware services only, and does not include technical support costs.) Approximately 43% was designated to elementary issues, 38% for secondary issues, and 19% for District. During the past five years, the student to computer ratio at the elementary level has gone from 29:1 in November, 1990, to 8.44:1 in April, 1995. (S.D.#23)

Equity of Access to Technology

Technology based learning resources will be made available to all students, not just to those in certain subjects, classes, areas, grades or categories. All students in this district are included in the Committee’s pursuit of the above Statement of Purpose, Vision and Mission. To this end the Committee will establish procedures to ensure that funding allocations to school support increasing equity of student access to technology appropriate to their skill levels and needs, both within each school and across the district.

Statement of Purpose:

See School District #38 Foundations.
We strive to enable all students to realize their potential, to acquire the knowledge, skills and attitudes needed to contribute to a healthy society and a sound economy, today and in the future.

Access to technology, and the lack of access can create great inequities in the results of the teaching/learning process.

Equal Access:

Students will have access to current information technology appropriate to their learning needs. (S.D.#62)

These findings leave little hope that the status quo will be altered. as the “status quo encompasses a set of values that underlie particular, definite practices. When access becomes associated with students’ skill levels, attitudes, and needs warning signals ought to flash because limitations are becoming enshrined. In this sense the status quo is an approach, although it is usually not articulated and is often enacted without a conscious decision.” (Landis, 1995) The practices and beliefs indicated in the above texts are representative of the majority of those districts who chose to include some reference to equity in their plans.

Equity: Conflicting Concepts

The following texts demonstrate resistance to the concept of righting the consequences of inequity. The idea of placing more resources, in places which have fallen behind, appears to cause some concern to the policymakers. Equitable appears to mean “fair and equal” but not too equal lest those who have the advantages appear to loose them in the short term.

Achieve a fair and equitable distribution of technology amongst schools within the district while at the same time not penalizing schools for their initiatives. (S.D.#17)

To achieve a fair and equitable distribution of
technology amongst schools within the district while at the same time not penalizing schools for their entrepreneurial skills. (S.D.#52)

Equity

Individual Schools will develop their own technology plans within District networking and software guidelines. To ensure equity, technology funds will be distributed to schools on a per capita basis, keeping in mind the different student/computer ratios required at the elementary and secondary levels. This will ensure equitable distribution of funding without penalizing schools for the efforts they've made in the past or for special funding projects put in place to enrich their technology environment. (S.D.#55)

Equity

One of the larger issues for the Board to consider is the equitable distribution of technology in the district. Inequities exist. Initial distribution of equipment has gone to those schools where staff have expressed an interest and have had some expertise. Other staffs have not shared the same level of interest. Some parent groups have been very active in their support of their school acquisition of new technology. The recommendation that the Board have been considering are to establish minimum standards based on student to computer ratios for schools. The Board would then act to ensure all schools meet the standard. The initial funding in the proposed plan would see some of the needs of those schools who have the least being addressed first. Schools that have had support from parents would not be penalized over the five years. (S.D.#65)

Qualitative and quantitative measures of equality are not differentiated. The effects of qualitative differences are scarcely recognized in the texts of the district technology plans especially as concerns equity. In my role as a practitioner, I found the following quotation to be one which clearly identified the difference between equality and equity using terms and
concepts with which teachers are familiar. Few teachers would argue against the principles implied in "remedial help" however discussions around the degree and forms of this "help" would incite controversy.

We can distill three underlying principles to equal access in education: everyone deserves to be treated the same; just as there is no justification for discrimination, neither is there cause for extra remedial help; and it is not the responsibility of the educational system to take individuals' different experiences, interests and abilities into account. These underlying principles lead to an emphasis on teacher "inputs" as opposed to student "outcomes" (Streimatter, 1994, 8) Equality of inputs is an issue for equal access at every level of the educational system, from how a district allocates its funds to how a teacher communicates with boys and girls....

Consider the fact that equal access is even less progressive than the theory underlying the British Columbia Ministry of Education's 1994 educational guidelines for Kindergarten through Grade 12. While the goal of equal access is to treat everyone the same, regardless of the probability that outcomes will remain unbalanced, British Columbia's guidelines explicitly focus on equal outcomes:

The education system is committed to helping both boys and girls succeed equally well in the school system. Teaching, assessment materials, learning activities, and environments should acknowledge and encourage the experiences, perceptions and contributions of both genders. (B.C. Ministry of Education, 1994,2)

(Landis, 1995, pp.41-42)

Approaching A Definition in Policy

The following texts serve as examples of districts who have attempted to place the concept of gender equity or equity in general into their technology plans. Once again I have included a lengthy selection from School District #38's text because it addresses the issue at the root level in how the placement of technology affects those who teach with the technology and by implication their students. Much of the text is in the form of questions because I did not know the answers. I wrote the text with the expressed intent to spark discussion and receive feedback. I marveled at the
opportunity to see how these ideas would be received. I looked forward to the feedback. There have been no responses to the questions posed or to the concepts of equity and “representative balancing” that were expressed. 141

Educational Equity 142

Providing comprehensive training at a level that could make a significant difference to every staff member is likely to be beyond the range of available funding. Yet equity concerns raise an argument against focusing efforts on the already well-positioned, even if they as leaders can have a broader impact by sharing their experiences with others. A related key issue to consider is who should have priority for technology-related training. Should resources concentrate on supervisors, teacher-leaders, support staff, or on those most in need of improvement? On math and science teachers, since technology applications are proceeding rapidly in these fields, or on humanities and other fields, since they have been somewhat neglected to date? On specialists who work with children most at-risk, or on "regular" teachers who work with all children? On elementary or secondary school teachers? On clerical staff and Classroom Assistants? These questions 143 will direct our professional development plans for the year/years to come.

"... equity is concerned with the promotion of personal, social, cultural, political, and equality for all who participate in the education system of British Columbia. The term "gender equity" emerged out of a growing recognition in society of pervasive gender inequities. Continuing traditions of stereotypical conceptions and discriminatory practices have resulted in the

141 Responses were generally invited in writing. Two face to face meetings took place but the duration of the meetings and accompanying presentations did not leave time for direct and intensive feedback to specific sections of the text. In the future should the topic of equity be pursued in this format it should be singled out as a topic in its own right rather than be sandwiched between the more pressing interests of the distribution of funding and hardware!
142 Heading from the original document.
143 This ought to have read as follows: The answers to these questions will direct...
systemic devaluation of attitudes, activities, and abilities attributed to and associated with girls and women. The negative consequences of stereotypical conceptions and discriminatory practices adversely affect males as well as females."

Ministry of Education Publication from the Web [sic]

If equity issues are not surfaced openly then too readily will technology become another source of power differentiation within the schools. Therefore when workshops are offered at the district or school level attention will be given to who the attendees are. Representative balancing includes gender, curricular area, administration, teaching and support staff, and in some cases, students and parents. Night school, Saturday and after school courses have some drawbacks for many with family and caregiving responsibilities. In the interests of educational equity there should therefore be some responsibility on the part of the district to provide opportunities for those who otherwise would be denied access to training

Guiding Principle:

Equity issues will be addressed in the delivery and content of staff development.

Although the following text does not strictly conform to the gender and technology concepts that have been the thrust of this thesis, it does bring to light another area in which "equity" issues play themselves out and impact on those who reside in geographically isolated areas. Given the "enduring purposes" of public education I was pleased to be reminded by these policymakers of the rural versus urban perspective.

Equity of Access

The Canadians who lack access to information
technology are those in rural, remote areas. They tend to have fewer educational resources and poorer telecommunication facilities. At the same time Internet providers concentrate on urban markets, not rural areas. Unfortunately, most networking/distance learning initiatives have provided access to learners in urban areas. Such communities tend to have higher than average incomes. All our students are located in small rural communities in North Central BC. This district is committed to the notion that our students are, paradoxically, the most in need of access to information age tools, and the least likely to encounter these tools given their rural northern setting.

Northern interior communities face a number of challenges due to their small size and geographic dispersion. These factors make equity of opportunity and access a major issue. Special initiatives, partnerships and infrastructures are required to redress the imbalance of opportunity experienced by citizens in our region. In our view, technology can act as an equalizing agent in this situation. Nevertheless, limited opportunities, timetable restrictions, facilities and equipment bottlenecks, and trainer shortages in specific skill/knowledge areas are the greatest constraints to skill development, career exploration and educational change. The School District believes it is possible to create an environment that minimizes such constraints, encourages economic development and shifts a resources based economy towards the role of an information age competitor. (S.D.#56)

The following fragment of text from School District #92 (Nisga’a) is an important reminder of the inequities that are experienced on a daily basis by the First Nations people in our province. When I began my analysis of the plans it was this one that gave me hope that there were others who were realized the importance of equity in association with technology and were prepared to acknowledge it at the policy level.

The opening statement of the philosophy of School
District No.92 (Nisga'a) contains the statements such as "the provision of equal opportunity for all students to develop their individual, spiritual, intellectual, mental, social, emotional, and physical potential at the maximum level, regardless of race, color, creed, or sex."

To this end, the technology plan of the District allows for a combination of school-based and District level decision making with respect to the long range goals of the purchase and use of technological advances. The rationale for the decision-making at two levels is the result of the relatively high turnover of teaching and administrative staff over the years. This turnover has resulted in "have and have not" schools with respect to the acquisition and use of technology-related equipment and services. Thus, in an attempt to create a more equitable and functional system of allocating funding for the purchase of more current equipment, the District has a centralized plan for major purchases, a school-based method of acquiring appropriate software and accessories and a combined in-service program to address both District and school level needs. (S.D. #92)

There were only two additional districts which contained texts which explicitly included the concept of gender equity. The first example stands in contrast to the second example in that it demonstrates a more thorough understanding of the concept.

Students should be encouraged to improve their computer skills regardless of sex, age, mental or physical capability. Barriers to equity should be proactively identified and removed. (S.D. #4)

[Computer Advisory Committee] CAC Position
- that all learners must have equal access to appropriate technology.
- that computer technology is an integral part of curriculum.
- that technology is playing an increasingly more important role in supporting successful learning
- that libraries be automated and be connected to a wide range of information sources.
• that the efficient implementation of the use of technology requires access by students and teachers to appropriate learning resources
• that we promote gender equity in the access to technology. (S.D. #48)

The final chapter will begin with a short summary of the last three chapters placing the findings of this research into the framework by Dorothy Smith represented earlier in this chapter. The implications of the research and discussion of some of the important concepts will follow.
CHAPTER 4 WHAT REALLY COUNTS HERE?¹

Many of dreamed up republics and principalities which have never in truth been known to exist; the gulf between how one should live and how one does live is so wide that a man who neglects what is actually done for what should be done paves the way to self-destruction rather than self-preservation. Machiavelli, The Prince (1514) (as cited in Fullan, 1990, p.102)

My topic is complex, interdisciplinary and contentious. This thesis examines the construction of policy and the place of gender in the British Columbia District Technology Plans of 1995-1996. An analysis of the constitutive concepts of “technology” and “equity” as they relate to teaching and learning in the plans is described. Embedded in these texts were the social and political contexts of the practices and social relations of the time and place in which they are written. These texts make visible the many “phases of the organizational and discursive processes that [were] otherwise inaccessible.” (Smith, 1990b, p.217) They represent textual windows into the committee and organizational structures which constructed standardized conceptual and categorical forms which were evidential as the “ruling apparatus” of technology within the school districts of British Columbia.

Synopsis: Literature Review

The main thrust of the literature review was to establish that education for women requires something much more consequential than “equal” access. A brief chronicle of the “malestream” western culture of science (Noble, 1992) preceded the citing of evidence indicating that

¹ Heading from the original document.
women remain significantly underrepresented in scientific and technological occupations (Shulman, 1994). A symbiotic relationship of science and technology is described as are the socio-political, economic and gendered effects of this relationship (Franklin, 1990). Examples of the [in]visible influence of women in the development of technology (Wacjman, 1991) are included to emphasize their absence from the traditional histories of technology (Mackenzie and Wacjman, 1985; Stanley, 1983, as referenced in Mackay, 1991) as well as and to make the point that a similar absence of women will likely be paralleled as technology is introduced into education because technology is a gendered, negotiated system.

As a resident in the education system I found Cuban's (1985) Teachers and Machines, a historical retrospective, to be highly relevant in its representation of the teacher/machine [technology] relationship. His book is a description of a familiar discrepancy between the experienced world of the classroom and the much heralded, unharvested promises of technology. Cuban writes convincingly of the resilient resistance in educational settings to change despite the presence of computer technology for the past 20 years. The promises of technology will likely continue to follow a predictable course: first, the promise; next, a limited introduction and adoption of the technology; and then, the disillusionment and fall into disuse, if we continue to use new technologies in ways consistent with old practices (Cuban, 1983; Mehan, 1989).

My personal experiences of long standing inequities in education, with or without the addition of new computer technologies, was born out in the literature review. Research on computer use in schools finds boys “more technologically motivated” than girls (Nelson and Watson, 1990-
91). When taken in conjunction with a boy-centered computer culture (Acker and Oatley, 1993) the challenges that females face in becoming "computer literate" are not inconsiderable. Both Char and Hawkins' (1987) and Mehan's (1989) work emphasize the mutual influences of the social organization of the classroom, social practices and technology. Inequitable access for females is common (Sutton, 1989; Collis, 1991). When the relationship between expertise and knowledge is examined, ideological and social constructions (including gender) appear to have more to do with expertise than technical competencies (O'Riley, 1991; Bryson, 1993). Females, both as teachers and as students, find themselves challenged in the education system. (Acker, 1995; Gaskell, McLaren, & Novogrodsy, 1989; Gaskell & McLaren, 1991; Gaskell, 1992; Reynolds & Young, 1995; Sadker & Sadker, 1994; Sadker, Sadker, & Klein, 1991). The introduction of new information technologies into this system interjects yet another obstacle to be overcome.

Synopsis: Methodology

Two methodologies were combined in order to excavate the context of the educational location of School Districts' Technology Plans in British Columbia. First, a quantitative analysis and a comparison of courses related to the areas of science and technology was undertaken. English Language Arts, Learning for Living and Fine Arts served as a counterpoint. The composition of classes was analyzed by the sex of the students and by the sex of the instructors. Second, the official government texts preceding the Technology Plan Initiative were summarized to illustrate the Ministry of Education's expectations. Third, the texts of District Technology Plans were analyzed to interpret the social relations and social practices embedded in the texts. Texts, whether from schools, districts, or the Ministry of Education, were
considered representative of the official praxis of those institutions and bureaucracy. (Smith, 1990a, 1990b) Specifically, these texts were examined to determine their understandings and representations in four areas: equity, curriculum, staff development; and technological determinism.

**Textual Construction of Policy**

Professional and bureaucratic procedures and terminologies are part of an abstracted system. Abstracted systems are set up to be independent of the particular, the individual, the idiosyncratic and the local...[sic] In actual operation...[sic] the abstracted forms must be fitted to the actual local situations in which they must function and which they control. In practice the abstracted system has to be tied to the local and the particular. (Smith, 1975 as quoted in Smith, 1990b, p.153)

The following schematic (see Fig. 4.1) (adapted from an earlier one in Chapter Three, p.71) is a representation of the textually mediated communication, action and social relations incurred as a result of participating in the production of the District Technology Plan(s). As I was unable to access the face to face meetings preceding the construction of the texts, and which are now likely fleeting memories for the participants of those organizational planning meetings, I chose to use the textual products [The District Technology Plans] of those meetings to investigate the social relations and discursive practices. The meaning made at those meetings has been detached from the local contexts of interpretation and replaced by a "distinctive formation of social organization mediated by texts." (Smith, 1990b, p.211) From my perspective, the result of this "distinctive formation of social organization mediated by texts" is a district technology plan or policy for the development of a "new / old" <or> static social [re] organization. A
social [re]organization charged with the specific task of purchasing technology equipment, training staff to use the technology [teacher development] and the integration of the technology into the curriculum.²

Figure 4.1

Smith argues that it is the textual product of social organization which has made it possible to externalize social consciousness in social practice by objectifying "reasoning, knowledge, memory and decision making, judgment, and evaluation, etc., as properties of formal organization or discourse rather than as properties of individuals" (p.211). The written or printed form creates extra temporal modes of meaning thus transforming our relation to language, meaning and each other. The end result being that industrialized societies are "organized

² See Chapter Three, Ministry Requirements, pp. 84-85.
by textually mediated forms of ruling ... [with] the various sites of
governing, management, administration, discursive relations,
professional organization, etc. loosely coordinated as a complex of ruling
relations and apparatus." (p. 212). The District Technology Plans are
constructed as textual policy to speak on behalf of the school district to
government, district staff, parents, trustees, and other public "readers"
and furthermore are representative of both the structure and the product
of social relations and the ruling apparatus.

A continuous feature of an organization's functioning is the
transcription of its processes into textual formats. 'Discourse', as used in
this analysis, is the production of the textual practice of the ruling
apparatus which intersects with the hierarchical structures of
administrations, government or organizations and, as such, is in and of
itself, a distinctive textual practice. This communicative textual process
serves to coordinate, monitor, and order social relations as well as the
site of the ruling apparatus in dispersed settings. Individual textual
discourses are not idiosyncratic. In fact, textual processes/discourses can
be conceptualized as culture or ideology. For this reason, consideration of
other socially organized practices, are integral to the analysis.

In the case of my research I considered the background documents³
to be connected to the Technology Planning Initiative as well as integral
to its textual analysis. The June 1995 Correspondence, a directive,
between the School Districts and the Ministry of Education was included
as a background document because of its strategic importance in the
textual outcome of the District Technology Plans and policy development.

³ The PACET Report. Putting Policies into Practice. The Kindergarten to Grade 12
Education Plan, and Technology in British Columbia Schools
The Findings: Textual Construction of Policy

The language of the background documents is reflected in the District Technology Plans. The notion that cost-effective and efficient delivery of services, programs and resources is synonymous with the introduction of new technologies is found in the plans and is present in the PACET recommendations. The foregoing was often used as justification for introducing technology into schools and district offices. Another common claim, found in PACET, and Putting Policies into Practice, is the idea that information technologies will help to create a more equitable and accessible public school system in addition to preparing students for future careers and further education. The requisiteness of technology or technology literacy was a common theme in all the background documents where computer technology was described as an “integral part of the required provincial curriculum”. Essentially all claims were unsubstantiated. References within the School District Technology Plans were by and large limited to the identified background documents.

There was scant engagement with ideas outside of the Ministry requirements. The possible influence of two writers on the team, graduate students studying the effects of technology and bridging two very different cultures, School District #38 was anomalous. This plan includes a comparatively extensive philosophical foundation to guide its implementation of technology in education. The more common tack was resolute adherence to the belief in extensive value accompanying the acquisition of machines/technology. Critical reflection and skepticism were nonexistent.

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4 See Technology is Efficiency and Deliverables in Chapter 3 for documentation
The Implications: Textual Construction of Policy

The lack of "references" to be found in the texts seem curious. As a graduate student, I am steeped in a culture where knowledge is predicated on the corroboration of the research findings of others. Without the authentication of information, the validity of one's premises are in doubt. Smith offers the following explanation:

Knowledge involves a social dimension; a coordination of activities with respect to common objects and an abandonment of the presence of the knowing subject(s). The subject(s) disappearance accomplishes and externalizes the distinctive and overriding power of knowledge as a specialized form of social organization. (Smith, 1990a, p.66)

The District Technology Plans presented their texts in a manner that suggested factual status; indicating that the information had attained this status through some "scientific finding" or "common knowledge" status. This was especially the case when rationales or justifications for "content" were being presented. Smith explains this phenomenon as follows as:

The progressive "forgetting" of the originating researchers and research... As the findings of a piece of research become taken for granted, they are finally incorporated into the texts of the discourse without reference to their source. Factual conventions of writing present the statement without the modifier that locates it in a particular subjectivity; to qualify a statement with the modifier "I know" is to deprive it of factual status. Achieving facticity obliterates the historical and specific source; the work, the local setting, and the authorship of particular scientists are forgotten. Within the text, the reader finds what is presented thus as a given. (Smith, 1990a, p.66)

\(^5\) The Kindergarten to Grade 12 Education Plan, p.9
In the midst of preparing this final chapter, I read Ragsdale's (1988) *Permissible Computing in Education: Values, Assumptions and Needs*. I found several common themes between Ragsdale's book, written some nine years ago, and my current research findings. Ragsdale wrote about the unstated assumptions and underlying values associated with computers in education. He had argued the need for a discernment process and an informed, cautious acceptance of computers in education. All, too often, technology is adopted not because it fills a human need in society or for an individual but because it is new and exciting. The themes Ragsdale addresses are suggestive of a prosaic chant whose lyrics are ever so familiar. Technology will prepare students for the future. Technology will bring students greater choice. Technology will motivate... Technology will stimulate.... Technology will encourage...

The textual analysis of policy as evidenced in my examination of the District Technology Plans seems an effective means of determining underlying technology values. A further outcome of reading Ragsdale was the realization that the values and attending thematic content have not substantially changed. It is a revelation I would have preferred not to have had, for it leads one to accede to the old adage that we are doomed to repeat history. What indeed is the role of theory, research, and knowledge at the end of the twentieth century if we as educators are ignorant of our history as well as our collective knowledge? How do we ethically implement new initiatives if we have not taken the time to search the "relevant" literature for our "accumulated wisdom"? In education, how are we making decisions at the policy level in government, in school district offices, and in schools? Each of these questions suggests further areas for investigation.
In Chapter Three, the Ministry’s requirements for technology funding were described. The District Technology Plans appeared to adhere to the requirements of the “letter”. In my opinion, the “letter”, by its narrow scope, likely restricted the discursive process. Although I am not comfortable speculating as to the “value” of the resulting plans as a result of this limitation, I am now curious about whether or not and to what degree the Ministry’s background documents and requirements influenced the outcome of the technology planning process. I propose that a more consequential question for further investigation is the relationship between policy, social relations / organization and the enactment of these policies in practice. My particular interest would be the continued monitoring of relationships between social relations of ruling, technology and gender equity.

Lyon (1991) writes about the politics of technology and the information society. Lyon exposes another direction for further research as the District Technology Planning Initiative will be in place for several more years. How does the political climate at the provincial, district, school or committee level influence the direction of the constructed textual realities in the process of planning? The following quote bears some thought:

Reducing the debate to the technical means that people are denied the chance to participate freely at the level of morality and justice, and thus also to affect outcomes by means of political action. Today, IT developments illustrate this well. Slogans such as ‘a computer in every school’ or ‘automate or liquidate’ narrow any discussion to the question of means, rather than ends. ‘Why do children need exposure to keyboards and screens?’ and ‘who will benefit from automation?’ are the unasked questions which lead logically to a consideration of valuing and purposes. Moreover political decision are frequently presented to the public as a fait accompli. Few...are privy to the reasons why a new cable

Beyond the political climate there is the larger issue of ethics. Brunk (1985), in his article, *Professionalism and Responsibility in the Technological Society*[^6], asks hard questions associated with professionalism and responsibility. I have adapted Brunk’s questions to coincide with the vocabulary established in this paper. How does the concept of professionalism operate in the social relations of organizations? As professionals / organizations involved in Technology Planning how will our professional / organizational success be judged? Will it be measured by some “socio-economic” criterion? Or perhaps by some criterion which gauges how well we have “learned” to serve the technology master?

I concur with Brunk’s premise that the planning for, and the implementation of, technology with its accompanying systems, includes assessing the moral implications of the control and design of the technologies in addition to the potential social effects. Perhaps more consequential to the underlying theme of my paper is Brunk’s association of technology with the people and the organizational structures involved in its design and control.

...Professionalism embraces the principle that with increased knowledge and power comes increased responsibility...it is precisely because the professional has greater understanding of the implications for good or ill of the technology or skill she practices that she also has a greater responsibility to protect the social good.....This means that insofar as the professional derives personal benefits from the advance of technology, for example, she

[^6]: This article is not about technology in Education. Rather, it is about the technology that created the atom bomb, chemical weapons and military experimentation in space. His arguments are eminently transferable to the profession of and professionals in Education.
also then carries a greater responsibility to see the technology is used in a socially beneficial way than does someone else who does not benefit in the same way. Thus, not only is it not *inappropriate* [sic] for the professional to take public moral stands concerning the moral impact of her profession on society, as we have seen the traditional professional ethic says, but it is a positive professional *responsibility.*” (Brunk, 1985, p. 151)

Brunk’s argument for a responsible ethic of “Conscientious Professionalism” rests on the principle that increased responsibility accompanies increased knowledge and power. In my reading of the District Technology Plans I was struck by the detailing of the material tangibles (i.e. inventories, hardware, software, computer operating systems, peripherals, modems, standards, protocols, cabling, connections, funding, expenditures and so on) whereas the detailing of the human enterprise (i.e. teacher development, equity issues, curriculum, and implementation issues) is relatively deficient in comparison. The responsibility ethic of “Conscientious Professionalism” as it applies to the human interface between technology and education could be called into question in the details of the District Technology Plans. The plans contained examples where the responsibility for this woman / machine relationship was shrewdly aimed in the direction of the teachers. I would suggest that the political overtones in this instance are acute. Moreover, I would argue that this is an ethical issue which we ought to be addressing.

**Texts and the Relations of Ruling**

Textual realities mediate the coordination of activities not only between and within organizations but also in society at large. At first

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7 Smith, 1990b, subtitle.
glance, textual realities appear as "innocent informative data" (Smith, 1990a). This is deceptive because of the interposition of the intricacies of the social organizations of ruling that inhere between the local actualities and the surfaces of the texts. At this juncture I wish to introduce the Crown Publications data source used in Chapter Three as being an example of such "innocent informative data". These statistical/numerical texts, which were employed in the data analysis are products of the Ministry of Education's apparatuses of ruling. In one sense, their production can be described as legally required. The outcome of which is that the districts [the local and particular] have no voice in how their lived realities are represented. The production of these texts assume organizations of power and in turn expose the objects of this power. The numerical data sets used in the construction of the Counting Teachers and Counting Students sections of Chapter Three "innocently" reveal the underlying relations of ruling and are invariant as to time, place, perspectives, and interests. These textual realities are factual objectified bodies of knowledge and are better known to us through the terminology, demographic data. The significance of the consequential ruling relations represented by these numerical and textual realities may not be apparent at first glance. Nevertheless, this demographic data represents how social, economic, and political policies and ideologies of government, organizations, institutions and society at large have been enacted. In my conceptual analysis of the data, I have interpreted the demographic data as [an] [ac]counting of an underlying "culture" representing the context in which the technology plans are to be implemented.

Some technology plans contained data that could be numerically interpreted. For this reason I chose to count the participants in the
textual construction of policy with respect to gender as I had done with the Crown Publications' data. I used this data to make some conjectures as to the social relations of ruling active in this production process. I also found by placing the textual conceptualization of equity alongside the demographic context I was able to speculate as to the degree of enactment of the province's gender equity thrust\(^8\). I was also able to view the ruling apparatus' conception of equity and associate it with technology.

**The Findings: Texts and the Relations of Ruling**

When “Counting Teachers” in Chapter Three, I found that the number of women involved in teaching technology related courses and the textual creation of the technology plans was not at all representative of the number of women active in teaching. A similar synopsis arises in the section “Counting Students” in that female students are not represented in a manner that is consistent with their overall numbers in the system. The omission of the women in representative numbers in the technology planning process brings into direct view the social relations /organization and “biased” practices of the education system as a whole. I would continue to argue this point vehemently especially when the counterargument is produced that women are not knowledgeable (experts) about technology and therefore their input would not benefit the planning process. One point I would make is that these women are the

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\(^8\) Gender equity is considered a cross-curricular interest and is contained in all new Integrated Resource Packages. Information Technology is also one of the cross-curricular interests. All curriculum appendices contain the following: “In addition to these three principles, the Ministry of Education wants to ensure that education in British Columbia is relevant, equitable, and accessible to all learners. In order to meet the needs of all learners, the development of each component of this document has been guided by a series of cross-curricular reviews.” [The three principles are: Learning requires the active participation of the student; People learn in a variety of ways and at different rates; Learning is both an individual and a group process.]
"beneficiaries" of the very educational system for which the plans are being shaped to "change". Would the women more than likely have insight as to why they may have been excluded in the past? As the literature review explained, and my analysis has demonstrated, the women/females are [in]visible.

I consider the demographic data, which I might add, is available and specific to each of the districts, to be an essential part of the district "context". As such, I believe it ought to be reflected in the District Technology Plan especially as the plan is created in a local context and the demographic data furnish a snapshot of previously enacted policies and practices.

In the 1995-1996 Review of Research in Education Sandra Acker argues for serious study with an emphasis not on women teachers but on integrating gender into mainstream accounts of teachers and teachers' work. In this analysis she reviews the general literature on teachers' work to identify major trends, noting where gender has or has not been taken into account. In addition, she considers literature written directly on gender and teachers' work. Her assessment of these two bodies of literature finds gender to be peripheral and with any specificity directed not toward gender but toward women teachers. I was intrigued as was Acker, by the comparison of two recent books, Changing Teachers, Changing Times by Andy Hargreaves (1994) and School Work: Gender and the Cultural Construction of Teaching by Sari Biklen (1995). Both books were about teachers' work. Biklen employs feminist theory and writes about gender-centered studies of women teachers whereas Hargreaves uses reform studies and work on postmodern society to frame his analysis. Each writer has several hundred references to scholarly literature, yet Acker found only 13 names in common. Neither
author cited the other. Mainstream research has occurred without featuring or considering the impact of gender. Gender analysis has not been incorporated in research on how "(changing) social and cultural expectations shape behavior and ideologies and how they are institutionalized in practices and policies" (Acker, 1995-1996, p.143). The point I am attempting to make is that my research, although not specifically on teachers' work, has been an attempt to take an aspect of teachers' work (technology), and using the lens of gender to examine the textual policies of the District Technology Plans as they relate to gender equity and technology.

Ragsdale (1988) included a chapter in his book devoted to equity issues when writing about the importance of considering values when introducing computers into education. He begins by stating:

One of the first points to establish is that the issue is "equity" and not "equality". Most definitions of equality stress such forms as "evenly balanced," or "in the same measure," much as the general public's working definition, while equity is linked to concepts such as fairness, impartiality, and justice. The problem is that many people do not distinguish between these two terms, seeing equity as being synonymous with equality. This confusion tends to obscure the discussion of equity issues in the use of computers, since most of the evidence introduced indicates a lack of equality, some, or all of which may not in fact be indicative of inequity" (Ragsdale, 1988, p.47)

Ragsdale's work is by no means definitive in the area of equity and technology particularly as "gender equity" has evolved as a concept since the book was written. Ragsdale's contribution was to suggest some of the components of computer equity, includes "sex equity", "race (ethnic) equity" and "socioeconomic equity".
My findings in the area of equity include the observation that the terms of "equity" and "equality" are used interchangeably. The conceptual implications of equity are not developed beyond getting access to the hardware. Inequities are described as the varying numbers of machines located in the schools. A common belief is that having access to networked computers will achieve "equity". When the terminology of equity is used it refers to "fair, consistent, and equitable" distribution of money or a "promise" for the employment of "fair, consistent, and equitable" practices. Always missing are the details. "Fair, consistent, and equitable" did not extend to righting the consequences of inequity. Rather, those who had excelled and were advanced in their acquisition of technology were not to be penalized. In practical terms the inherent meaning was even if one school had advantages that others did not have the school wanted its "fair share" of the district's allocated technology funding. In other words there was the expectation that the money be distributed equally. The fact that the advantaged school may be located in a socioeconomic area where parents had the resources to fundraise for the school was not taken into consideration. The term, gender equity, appeared in only, 8%, 5 of the 60 plans examined. The connection between technology and the social issues associated with gender equity was, by way of explanation, not at all developed with the exception of three school districts.

**The Implications: Texts and the Relations of Ruling**

Gender has a traceable influence in the organization of social relations. My work has only skimmed the surface when it comes to examining the connection between technology, gender equity, and the
effects of the social relations of the organization involved in the process of constructing policy for education. As I am attempting to bring this chapter to a close I will suspend discussion on this topic with the proviso that I believe that the examination of the gender / technology / education relationship is an important one for sociocultural analysis especially when considering the ramifications to curriculum, teacher development, and instruction. I cannot help but to wonder about the “costs” of the social impact on both students and teachers if traditionally gendered and inequitable structures are entrenched through the “uninformed” construction of policy.

Policy Documents and The Practice of Teaching

In the introductory chapter I alluded to the influence of Lave and Wenger in shaping the direction for this thesis. It was their work on “situated learning” and “communities of practice” that led me to think about the effects of social relations of technology use and technology planning. My observations of the education community in which I work leads me to speculate about how women would fair in the currently gendered culture of technology. This question is particularly worrisome when asked in conjunction with Lave and Wenger's model where understanding is seen as a byproduct of engagement and participation. How are women teachers and female students to “learn” without radical changes to the current social organization and culture of computing. As the literature review demonstrates, women have relatively limited access to technology. To make matters worse many of the barriers they face are [in]visible ones, some of which, I now conjecture, exist at the
policy level. In order to explain this premise further, an overview of situated learning is required.

"Situated learning" (Lave & Wenger, 1991) is an analytic perspective used to explore the relationship between learning and the social situations in which it occurs. The central concept of "situated learning" is the relationship between the learner and her engagement in the actual practice of an expert. Lave and Wenger (1991) explain:

Learning is an integral and inseparable aspect of social practice. We have tried to capture this new view under the rubric of legitimate peripheral participation...(p.31)

... legitimate peripheral participation is not in itself an educational form, much less a pedagogical strategy or teaching technique. It is an analytical viewpoint on learning, a way of understanding learning. We hope to make clear...that learning through legitimate peripheral participation takes place no matter which educational form provides the context for learning, or whether there is any intentional educational form at all. Indeed this viewpoint makes a fundamental distinction between learning and intentional instruction. Such decoupling does not deny that learning can take place where there is teaching, but does not take intentional instruction to be in itself the source or cause of learning, and thus does not blunt the claim that what gets learned is problematic with respect to what is taught. (Lave & Wenger, 1991, pp.40-41)

From this analytic stance, learning is seen as participation in the social world as well as a dimension of social practice. Legitimate peripheral participation (learning) embodies the structural characteristics of the communities of practice in the production of knowledge. Learning in this definition is not a simple process of transfer or transformation because communities of practice "are engaged in the

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9 Expertise, as was demonstrated both in the literature review and in the previous chapter, is a "protected" enclave especially when expertise translates into power and prestige as it does in the case of technology.
generative process of producing their own future" (p.57). This particular point is at the center of the problem I have identified in this paper. If the policymakers are at all protective of their "positions" or "futures" then how do they create policy which may in fact remove them from center stage or realign their source of power?

Contradictions in the collective social practice are part and parcel of the learning process. Social reproduction implies either reestablishing or resolving underlying conflicts. Reproduction cycles are important in that they leave a "historical trace of artifacts - physical, linguistic, and symbolic - and of social structures, which constitute and reconstitute the practice over time." (p.58) It is here that I hope my reader begins to see why I have included Lave & Wenger in this final chapter. The analysis of the data in this thesis, has resulted from the tracing of "historical artifacts", evidence of textually mediated communication and of the social organization, which constitute the social relations and discursive practices in the community of practice wherein the plans were constructed. The texts (the District Technology Plans) represent current understanding in the areas of technology, equity, curriculum, instruction, implementation and staff (teacher) development. The epistemological role of situated learning and legitimate peripheral participation thus has repercussions which ought to reverberate across the education community. Lave and Wenger's description of this point follows:

The artifacts employed in ongoing practice, the technology of practice, provide a good arena in which to discuss the problem of access to understanding. In general, social scientists who concern themselves with learning treat technology as a given and are not analytic about its interrelations with other aspects of a community
of practice. Becoming a full participant certainly includes engaging with the technologies of everyday practice, as well as participating in the social relations, production processes, and other communities of practice. But the understanding to be gained from engagement with technology can be extremely varied depending on the form of participation enabled by its use. Participation involving technology is especially significant because the artifacts used within a cultural practice carry a substantial portion of that practice's heritage... Thus, understanding the technology of practice is more than learning to use tools; it is a way to connect with the history of the practice and to participate more directly in its cultural life. (p. 101)

The significance of this epistemological framework is that it is not confined to technology or the creation of technology plans. It extends to include all forms of access to social practice. Once the social relations of ruling are exposed perhaps we will come to understand the interaction of the “artifacts” and their relationship to learning, hopefully, resulting in the creation of a more equitable environment for the learner.

The Findings: Policy Documents and The Practice of Teaching

The District Technology Plans often described collaborative ventures where students and teachers were involved in learning (with technology) together. However, there is a subtext aimed at teachers, which is an inculcation to acquire the requisite knowledge, skills and attitudes to teach with new technology. Also embedded in the texts are incomplete articulations about how teachers ought to teach when using new technologies. There is little or no differentiation between learning with technology, learning about technology and learning through technology. The common incantation was that new technology was now necessary for learning. Following this recitation was a list of skills or experiences which the authors believed to be essential for students and by intimation, teachers. The relationship between the skill lists and
curriculum was an ambivalent one. I found that technology in the curriculum and technology as the curriculum were by and large undifferentiated concepts. The curriculum / skills confusion was also in evidence in the descriptions of workshops and teacher inservice offered (or about to be offered) to teachers.

Only one district developed an explicit delineation of how and where technology ought to be integrated into the curriculum. The more common finding was that technology use was curriculum specific and the concomitant skills were quite specific to the curriculum in question. The inherent danger in this model is that it prepares the ground for perpetuating existing inequities as evidenced from the subject enrollments identified in the previous chapter.

Many technology plans also suffered from a confusion between the present and the future. Descriptions were such that the texts could be considered an exhortation of a future perfect yet written in such a manner that what they may have been taking place in the present. Technology was credited with determining new roles for learning, living and working in the lives of students and teachers. Technology was depicted as both an agent and a tool for change. The personification of technology as an agent assumes that we have limited control over its deployment and effects. Whereas if technology was singularly viewed as a tool then educators would likely have some autonomy in how and when technology is employed in their programs.

When the question of teacher inservice is added into the equation, one can begin to speculate as to one of the possible benefits of maintaining the agency of technology rather than conceptualizing it as a "simple" tool. For if it is indeed a tool, then like any other tool, there is
an expectation that the users of the tool be taught how to use it. By maintaining the contradiction of agency and tool, the responsibility for teacher inservice can be held at bay as is the case in the District Technology Plans where the articulation of (even) an outline for teacher professional development was inadequately developed.

The Implications: Policy Documents and The Practice of Teaching

Each of the areas of curriculum, instruction, implementation, and teacher development have extensive literatures of their own. To begin to formulate the implications of the confusion that was predominant in the plans in all of the aforementioned fields, is well beyond the scope of this thesis. Instead, I believe that Acker's notion of integrating the literatures on teachers' work and gender into mainstream accounts is the most likely place to begin to make sense of the contradictions. Curriculum and instruction are teachers' work. Implementation and teacher development are also teachers' work for they are both the actors and the audience for the concepts being inculcated. By using a gender lens and a multidisciplinary approach to the literatures perhaps we may come to understand the role gender plays in curriculum, instruction, and teacher development. Adding the technology lens to the equation would provide yet another perspective on the place of technology in education.

For now, I believe we ought to be asking questions about how and if human relationships are changed or indeed "inequitably" maintained when they are mediated by technology? What are the implications of the social relations in the organizations and the products of their deliberations? Is there a way to structure the organization of the policy making committee(s) such that knowledge, responsibility, and equity (as
previously articulated) are operational concepts within the production process?

CONCLUSION

Brunk's (1985) argument for "conscientious professionalism" and Ragsdale's (1987) examination of "permissible computing in education" suggest that there are questions that ought to be asked and answered before the indiscriminate introduction of new technologies into the education system and while this ought to be (have been) in place before exhorting entire "systems" to embrace the economic and social burdens that accompany broadscale implementation of new technologies. Otherwise, as public educators, we leave ourselves open to charges of "educational malpractice" as portrayed in a recent article, "The Computer Delusion". Oppenheimer (1997) argues that "[t]here is no good evidence that most uses of computers significantly improve teaching and learning, yet school districts are cutting programs - music, art, physical education\textsuperscript{10} - that enrich children's lives to make room for this dubious nostrum..." (p.45)

Oppenheimer's expression, "The Computer Delusion", is a reminder that the questions that have been posed with reference to technology and equity are not ones that reside solely in the academic community. Society in general will be offering their interpretations of the directions that educators ought to be taking. Oppenheimer's entreaty is quite different from that of the Ministry of Education's which leaves me wondering when the "romanticized truth tale[s]" (Bryson and De Castell, 1994, p.203) will be demystified and educators and researchers will be

\textsuperscript{10} In British Columbia programs attached to nonenrolling teaching personnel (e.g. library) are also being eroded.
called to task to explain our use/nonuse of new technologies. Our answers will require an understanding of the relationship of educational technologies to the practice of teaching and learning. Smith (1990a, b) and Lave and Wenger (1991) have, I believe, provided us with the epistemological frames to begin the search for answers to the complex questions; answers which can transfer across theory into the socio-practical field\(^\text{11}\) of the educator and her public.

Fig. 4.2 “Woman Free” ...an illustration by Edwina Sandys

\[^{11}\text{This is concept has not been introduced in this paper but it is one that bears some attention as the work in this area begins. The concept comes from the work of de Castell and Freeman, 1978.}\]
BIBLIOGRAPHY


PROVINCIAL TOTALS: GENDER COMPOSITION OF EDUCATORS / FULL & PART-TIME

REGIONAL TOTALS - GENDER COMPOSITION OF FULL AND PART TIME EDUCATORS

CENTRAL INTERIOR
FRASER VALLEY
GREATER VANCOUVER
KOOTENAY
NORTHCOST
NORTH ISLAND
NORTHERN B.C.
OKANAGAN
SOUTH ISLAND
TOTAL

REGION

PT FEMALE
PT MALE
FT FEMALE
FT MALE
Our school system has been slower than the business, medical and scientific communities in the introduction of technology into the learning environment. Based on what is happening in this external environment, it is possible to gain some insight into what is possible and what to expect within the educational environment. This section is designed to stimulate further thought and discussion and assist in the decision making process as the district develops and implements a new technology plan.

1. The technology industry will progress more rapidly in improving reamer and teacher access to, and interface with, technology to support learning and teaching. Key progress areas will include:

   - much better human-machine interfaces, including voice input and pen-based systems.
   - much greater availability of personal electronic assistants and personal electronic notebooks. This technology will become part of our day to day routines, including travel between school, home and work.
   - much greater computer access in our homes. Home information retrieval systems and "edutainment" centers will be common. Connections will be made by means of telephone lines, cable services and satellite services to multiple entertainment, information and educational services. Fiber optic capabilities supporting interactive video between homes, businesses and educational organizations will be common.

2. telecommunication services, including electronic mail and access to on-line databases and fax. Computers will be networked within the school, district offices, association offices, community reaming centers, post secondary organizations and government ministries. Communication by all reamers and teachers will occur regularly on a district, provincial, national and global basis.

3. the library, The concept of the library as a singular place will gradually disappear as more information is stored and distributed electronically. The contents of personal libraries will grow rapidly and be customized to individual needs.

4. The integration of software into the curriculum will occur in three broad areas: generic productivity tools, subject specific tools and reamer-centered tools. All three types of software use will grow rapidly during this decade.

5. Generic tools are general purpose resources that can be used in many different disciplines. At the elementary and middle school levels, students will learn to use word processor, database, computer graphics and publishing programs. At all grade levels, there will be increased use of multimedia, from desktop publishing and desktop presentation to sound, graphics and animation in everyday student
projects. There will be a proliferation of various templates upon which students can build so that they will not start from scratch with each project.

6. Subject specific tools will be developed by professionals in each discipline to enhance productivity and reaming effectiveness.

7. Learner-centered tools will allow the learner substantial freedom to explore and manipulate a multimedia reaming environment. The teacher, individual students and groups of reamers work together in this multimedia environment, often undertaking complex projects that cut across several disciplines.

8. Multimedia will have an increasing impact on content and pedagogy. Students and teachers will routinely work in a multimedia reaming environment. Learners will work on interdisciplinary projects, guided by teams of teachers from various disciplines.

9. Artificial intelligence and expert systems will be refined to solve complex problems. These systems will contain some of the knowledge of a human expert or group of experts in a particular field, and the system will attempt to solve problems in this field.

10. Teacher education programs will increasingly prepare teachers to move into computer-rich reaming environments. Teacher accreditation will require that all pre-service teachers become certified as computer and technology literate.

11. Distance education and computer-assisted learning will continue to become more cost effective and will cover a wider portion of the curriculum. Learning outside of school will become very common. Schools will restructure themselves to be able to provide these services and to take better advantage of the potential of computers.

There will be growing confusion about the most appropriate and effective roles that classroom teachers should play in the instructional delivery system. The teacher will become less and less the source of information or the information delivery system. Instead, the successful teacher will be a facilitator, a guide, a mentor, a role model and a learner. *(This material adapted from ISTE publications) [sic]
Linking Technology Plan to Curriculum Implementation

All staff strongly indicated the need for support in the areas of telecommunications and how to integrate computer and information technology skills into the curriculum. Telecommunication services will enable staff and students to collaborate, access and exchange information locally, provincially, and globally. This will allow staff and students exciting opportunities for personalized learning and the ability to integrate curriculum with information technology. A scope and sequence K-9 has recently been developed to enable teachers to link technology to curriculum. It is being made available to the schools and will be evaluated within the next few months. Integrated Resource Package's (IRP) provide teachers with teaching and assessment strategies to effectively use technology in instruction and monitoring student achievement.

Educational uses of computers can be said to be entering a fourth era, one which promises to make a lasting impact on curriculum and instruction. These eras correspond roughly to the 1970s, the early and late 1980s, and the 1990s.

The 1970s - Learning About Computers: During the early days of accessing mainframe computers, students in Computer Science learned to program, usually in cooperation with a local university or business.

The Early 1980s - Learning With Computers: As personal computers became available, programming remained, next arrived computer assisted instruction (mostly drill and practice) and word processing. With few computers available outside of Computer Science time, and with relatively little in the way of good Computer Assisted Instruction software, computers remained outside the educational mainstream and in the hands of the few.

The Late 1980s - The Computer as a Tool - Computers began to make a mark as tools supporting existing curriculum. Word processors, database and spreadsheet programs, telecommunications, desktop publishing, graphics and Computer Assisted Drafting programs, and more sophisticated Computer Assisted Instruction all served to enhance teaching and learning. More teachers and more students became involved, using computers in the writing process, for data access, and in elective areas such as Art, Drafting, Technology Education, Music and Journalism.

The 1990s - The Computer as an Agent of Curriculum Change: Educational experiences had been enhanced in the 1980s by using the computer as a tool. While we mustn't discard the extremely valuable "tool" nature of good computer software, we must address the fact that curricular experiences will be fundamentally charged in the coming years based on what computers can now do. Curriculum and delivery will be personalised by "computer managed learning'. Curriculum will be written or

1 Heading from the original document.
rewritten around the strengths of good software environments (particularly in math and science), and expectations of students will change in light of research, writing and publishing capabilities of technology. Multimedia and optical technologies will play a central role, as will record management systems which allow teachers, students and parents to interact freely.

Pervasive, Transparent and Enabling

There is a clear trend in society toward computers being "pervasive, transparent and enabling" -partners in learning and in life. We are seeing computers in the home and in the workplace, supporting a wide range of activities. Prices are dropping, computers are becoming smaller and more personalized. In the computer industry the public demand is perceived as "smaller, faster, cheaper, sooner." And computer companies are delivering.

As computers become personalized, faster, smaller and cheaper, they will become a part of everyday working and learning life.

"The future educational system I suggest implies a new organizational structure for schools and new roles for teachers. The technology will require not a minor perturbation of the current system, but a radically new system in which students will proceed individually through the learning sequences." Perelman

It is in this spirit and with this vision that a 3-year plan for instructional uses of technology in Trail is presented. This plan will be reviewed and revised annually to reflect the changing needs of the students and new developments in the curriculum and technology. (Appendix 8) (S.D.#11)

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2 Heading from the original document.
EXAMPLES OF TECHNOLOGY AS EFFICIENCY & DELIVERABLES

Since modern society demands an ever increasing level of media and information literacy on the part of its citizens, functioning successfully in our society means knowing how to effectively decode and understand messages in various information formats. Information literate people are those who have learned how to learn. They understand how knowledge is organized, how to access and evaluate information and how to use information in a meaningful way.

Schools that are committed to life-long learning are developing educational information networks to connect classrooms, computer labs and libraries providing students with information access anywhere in the school and through tools like the Internet, anywhere in the world. With electronic access to a combination of print, non-print and electronic resources, locating information can occur quickly and effectively, leaving time for the more critical process of applying information to meet individual learning needs.

Components of an educational information network can include:

- electronic information sources e.g. CD-ROM, video-disc, multimedia;
- on-line information sources e.g. databases, World Wide Web sites, subscription services;
- print information sources e.g. encyclopedias, dictionaries, reference materials;
- audiovisual information sources e.g. videotapes, kits, broadcast television;
- learning resource management systems e.g. inventory control, library catalogue and circulation system, media distribution.

Despite the possibility of unlimited access to off site information sources, there will continue to be a wide variety of learning resources housed in schools and in the district. The implementation of automated learning resources management systems in tandem with electronic information sources will increase the availability of information to students, will reduce the cost of management of resources, will maximize the use of existing technology in the school district, and will provide opportunities for enhanced communications in the future. (S.D. # 68)

We ... recognize that education is a multifaceted institution and technology, although pervasive, is only one aspect of our endeavour. Although the age of communication is still in its infancy, its effect on society has already been momentous. We are fully immersed in this medium through all aspects of our daily lives; how we access goods, earn our living, communicate with the rest of the world, and manage the marketplace. As the effects of communication on our lives continues to grow at an exceptional rate, it is increasingly important that students and the rest of society learn how to manage this growth in order to yield its
potential benefits. The key to this management is through the use of technology. (S.D.#43)

Technology is a tool that can increase the motivation of students, enhance collaboration between students and teachers, decrease behavior problems, provide more time on task, and address different learning styles of students. Technology will not replace teachers, however, it may change the teacher’s role. It should become a teaching tool that improves efficiency in learning by supporting and enhancing basic skills instruction, critical thinking and problem solving skills, logical thinking, higher-order thought processes, and learning in content areas. Powell River School District has formed a District Technology Committee to coordinate and implement district wide technology efforts and provide technical and programmatic support and assistance.

The functions of the District Technology Committee are to:

- implement a long range productivity plan for instructional and administrative used technology
- remain technically competent and familiar with new technologies.
- plan, develop, implement, and maintain instructional and administrative technology applications
- develop and implement plans for the review and evaluation of hardware and software
- develop district standards for hardware, software, and networking
- assist in the design and configuration of hardware and software systems based upon analysis of user requirements and available resources
- plan for the orderly acquisition of both the hardware and software
- evaluate and offer staff development activities that relate to technology training
- provide support and technical assistance to schools for technology needs
- identify exemplary research and development programs related to technological applications and, when feasible, coordinate the District’s involvement..... (S.D. #47)

As we approach the 21st century and restructuring becomes a major factor, educators must incorporate new technology into the instructional program and continually adapt methodology to ever emerging technology. In short we must become more effective and at the same time more efficient.

It is within these parameters that we have developed this productivity plan for Powell River Schools.

The major objective of this plan is to offer solutions that will:
• Give teachers the tools and information needed to teach, given the diverse skills of students
• Improve the quality of instruction
• Enhance the delivery of Instruction
• Increase student academic performance
• Motivate, stimulate and engage students in the learning process
• Equip students with the technology related skills needed to function and compete in the world of work and institutions of higher learning
• Improve efficiency, effectiveness and increase productivity of students and district personnel
• Improve access to information for school based decisions by school administrators (S.D.# 47)
STAFF DEVELOPMENT DELIVERY MODELS

Outline of teacher training and support program designed to enable all teachers to
integrate technology into their classroom learning environment.

Use of August professional development period

During August 1995 the district is offering:
• Advanced ClarisWorks
• Surfing the Net: Educational Uses of the Internet
• Intermediate Windows
• Establishing a Primary computer program
• Computerized reporting systems

During future summers the district will offer:
• Integrating technology into the Elementary classroom
• Integrating multimedia
• Creating multimedia

Increase teacher utilization of Community Learning Network to meet the objective
that 1/3 of teachers will be online in 1995/96, 2/3 in 1996/97 and all teachers in
1997/98.

Encourage district personnel to proactively utilize email for dissemination of
information.

Additionally David Thompson Secondary and J.A. Laird Elementary currently have
part time computer support teachers working towards integration of technology
into classroom learning environments.

Support includes:
• one-to-one assistance as appropriate
• in-class support where necessary
• direction of teachers to appropriate printed and online resources

David Thompson Secondary is also working on creating an inhouse online
information service utilizing HTML for teachers with links to a number of outside
resources

The number of resources will be expanded as the school's Internet access is
improved. (S.D.#4)
One model we are examining would mirror the current model of FSL inservice in our District whereby teachers who are delivering the curriculum are trained on a monthly basis by an expert. Release time is provided for this training. [S.D.#2]

Staff training is fundamental to the management and implementation of technology change and the integration of technology into the instructional process. When new technology is placed in schools, there is minimal funding provided for school based technological support. Therefore, it is necessary to train the school based resource people to effectively operate the networks and implement core software. The training program must also recognize the reality that the district's 1100 staff include people whose skills range from those needing the most basic introduction to computers to those who seek to upgrade already advanced skills. This a modular approach would likely work best.

Training and Inservice - Staff

The lack of training programs for any staff for the past few years and the need for training to ensure the successful implementation of the Technology Plan and [S.D.#22]Net combine to make training and inservice a high priority for all staff groups. From Internet access, through electronic mail and administrative programs to educational software there are many areas requiring training courses. (S.D.#22)

The principles which should govern the development of a training program include:

- Running the training program on a cost recovery basis. Keeping costs low for individual participants. Using local expertise as much as possible. Working closely with the VTA and CUPE to assess the needs of both teaching and nonteaching staff
- Addressing a wide variety of skill levels
- Keeping in mind the need for equity between schools
- Focusing on major common software platforms
- Ensuring that the training program addresses emergent needs

Since 1990 the District has offered a series of teacher training and support programs through out Okanagan College Technology for Everyone program. During just the past year, more than 110 separate courses, 175 sections and 1200 hours of instructional time have been offered, with more than 1500 individual registrations for these courses. Over the course of the past five years, the program has shifted from a primarily skills-based, button pushing focus to one that

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3 Heading from the original document.
increasingly addresses how and where the technology fits into the curriculum.
During the upcoming August Summer Institute, more than thirty 2 to 5 day courses will be offered.[S.D.#23]

Models of Training
Sites should determine their own needs. We believe in a trainer of trainer model and with that as a basis access to individual Pro-D, Ed Change Funds, district sponsored events both paid and voluntary will occur. More time needed peer model Teacher exchange, release time, Pro-d Integration of technology into curriculum Training needs to be ongoing. District support people need training too. Create email directory for minor troubleshooting. Site based training models. One step at a time.[S.D.#27]

Recommendations : Staff Development
- That the District establish a computer training lab for teacher in-service.
- That the District increase the staffing ratios for both middle and senior secondary schools to address the technical support needs of the school/staff as they arise out of increasing access to technology.
- That the District provide each teacher with access to a productivity computer.
- That the District establish an "incentive" in-service program for teachers.(S.D.#33)

Chilliwack School District Teacher In-Service Proposal
The single trainer model for the District is no longer adequate to satisfy the growing needs of the entire teaching community. It is imperative that teacher support with technology is expanded to accommodate the increased access to technology and demand for information.

Teacher In-Service Plan Outcomes:
Within five years:
- all teachers will be able to integrate relevant information technology into their curriculum.
- all students will be able to integrate information technology experiences related to all areas of study.
- School District 33 will have a team of technology trainers able to provide in service and workshops related to all areas and levels of study.
- all teachers will have had direct in service experiences from the team of technology trainers.

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The Plan:
Each year the District Technology Committee will select eight teachers who will deliver workshops at a variety of sites. These teachers will change each year so that a broad range of experiences are brought to the teachers in community. Four levels of workshops will be established; Primary, Early Intermediate, Middle School and Senior High with two teacher trainers assigned to each level.

Strategies:
To facilitate the delivery of in-service, the trainers will receive an entry-level computer for their personal use as long as they are employed by the District. Each trainer will be available to deliver five or more workshops over the course of their year of service. The workshops will be cooperatively developed and coordinated with the District Technology Coordinator.

To enhance the content of trainer workshops, specialists will be brought in from other Districts and the business community to share their expertise. Release time will be provided for trainers to attend the specialist workshops. The time, location and registration will be the responsibility of the trainer teacher. Workshops will continue to be advertised in the monthly Networking 33 newsletter to ensure maximum teacher awareness. Schools requesting trainers to present on Pro D days will access their staff development funds to cover release time and any additional costs.

Costs:
Release time for workshops will be minimal as most will take place either after school or on Professional Development days. Some release time should be allocated to allow trainers to attend visiting specialist sessions. Equipment costs will be limited to eight entry level computers per year which are recoverable as the District will retain ownership of the machines.

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Costs (8 computers @ $1600.00)</td>
<td>$12,800.00</td>
</tr>
<tr>
<td>Release time (36 - 1/2 days @ $85.00)</td>
<td>$3,060.00</td>
</tr>
<tr>
<td>Estimated Yearly Costs:</td>
<td>$15,860.00</td>
</tr>
</tbody>
</table>

Conclusion:
The implementation of this Trainer of Trainer model will broaden the delivery of teacher in-service across the District. Over the plan's five year period a wide variety of needs will be met because the training staff will change each year. Attendance will be guaranteed through the plan strategies. In the classroom, students will receive more learning experiences integrated with relevant information technology, supported by a technologically comfortable teaching staff. (S.D.#33)
A Vision for the Future: A Technological Landscape?^{11}

Technology has come to occupy an increasingly important role around the world as societies grapple with a wide range of social and economic issues. This is reflected in concerns over how to deal with the effects of the rapidly expanding "information highway", the threats and promises of the "knowledge economy", or ethical concerns about medical "bio-technology", to mention only a few.

The B.C. Ministry of Education has responded to these challenges in part with the publication of "Technology in B.C. Schools: Challenge and Opportunity". In this document the Government concludes that while the healthy and democratic society that we seek is dependent upon educated and literate citizens, at this point in our history something more is needed. And that something is "technological literacy", which according to the Ministry "builds on our aims for education by providing students with the resources to make informed choices about future work and education".

With this end in mind the Ministry of Education has requested each district to submit a District Technology Plan. According to the government this Plan will result in:

- more technology resources for schools, teachers and students; stronger partnerships between the provincial government and business to meet the technology challenges faced by schools; more relevant learning materials; better electronic links between schools; improved distance education; and an improved foundation and basis for integrating technology with learning in all parts of the province.

This seems to be a straight forward, pragmatic approach, which recognizes that updated and expanded technological resources hold the potential to improve our lives economically and socially. Put another way, in keeping with the high-tech environments of our homes, recreational activities and work-places, we need to have current technology in our schools, and we all must become "technologically literate". Governments and businesses of all kinds, from local to international, have accepted that "knowledge based" high tech industries are the wave of the future,

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^{11} This section of Richmond of Richmond School District's Technology Plan was written by Mr. Bob Mostat, a graduate student of Dr. Suzanne de Castell of Simon Fraser University and a long standing (15 years) trustee of the Richmond School Board at the time of writing the district plan.
and have established major policy directions in which information technology is the key to unlock the opportunities yet to emerge.

But should those of us charged with the responsibility for public education accept this vision in its entirety without some reflection? In fact there are a number of voices questioning these perspectives of economic imperative and technological determinism, because they threaten to overshadow what we hold to be central human values.

Technology and Philosophy

Our district's present philosophy of education was adopted early in 1989, in response to a decade of change in the community. By "philosophy of education" we mean a statement of what we believe about the roles and relationships of students and adults, and what we believe about teaching and learning, as an important way to guide our practice and to provide broad direction and vision as to why we do what we do. In the intervening six years the pace of change has certainly not slackened, and indeed as regards "technology" has probably accelerated. We now find a greater number of information and media technologies in our schools, and an increasing degree of "convergence" between them which appears to make them more powerful and thus more desirable for application across a wide range of curricular areas.

While we acknowledge the widely accepted "pragmatic" view of technology noted above, we would make the case that the use of technology is also profoundly philosophical in nature. We believe that our view of technology, whether broadly or narrowly understood, can affect significantly our vision of reality and how we relate to one another and shape our society. Questions about technology that are related only to who gets how much and how soon, we believe are not large enough to encompass its real effects on us as individuals and as a community.

Debate over the role and effects of technology is not something new. It is also not trivial. The proponents and detractors of untrammeled technological development hold and express their views by turns with logic and passion, and in the conviction that something important is at stake. To illustrate some of the issues involved, we shall consider very briefly perspectives that might "optimistic" and "pessimistic" views of technology.

The Optimists

Among the vanguard of the advocates of the promises of technology is Nicholas Negroponte (Being Digital). His is a vision of a new world, and a new way of life. This new way is largely characterized by the ever more efficient production, analysis and consumption of information, and in particular digitized information. Of particular interest to us is his enthusiastic re conceptualizing of libraries in terms of bits and not atoms. Atoms, the stuff we can see and touch, are difficult to store, transport and interrogate about the information they contain. However, as the data in books are increasingly kept in digital form, they can be easily moved, edited, combined, compared and consumed.
British Columbia's own Frank Ogden ("Dr. Tomorrow") has carved out an international career as a futurist predicting and extolling the benefits of technological advances. In his book (The Last Book You'll Ever Read), he makes a great number of predictions on the shape of things to come, including the effects of increasing self employment, the end of teachers as "education shifts from teaching to learning", and predicts the advent of robots for use in all aspects of human life. While some of these predictions may well come to pass (perhaps through sheer chance), what seems to be missing in this enthusiasm is a consideration of ethical or philosophical questions about choices of what might be a preferable future.

The advocates of the increased use of technology in education cite many benefits for students and teachers alike. For students, it is to stimulate interest in learning and the excitement of self learning; to gain a broader knowledge of the outside world: "it's like actually being there"; and to gain marketable information processing skills. Teachers will have access to a world of information to complement their expertise, and have the ability to collaborate with colleagues around the world. As students develop "information literacy", and become "knowledge workers", teachers will assume the role of collaborators and guides to students rather than as an authority simply dispensing knowledge.

Another Point of View

The perspective of these "optimists" might be characterized as a utilitarianism that says that if it works it is good, and if you can do something you should. Others, however, (sometimes called "pessimists" or "luddites") challenge this notion, and pose some questions that perhaps we as educators should consider. These are questions that have more to do with the nature of technology and its relationship to our collective being as social creatures.

Ursula Franklin (The Real World of Technology), for instance, challenges us to reconsider our notion of technology as simply machines, and to think about "technology as practice". In her view, technology is also "organization, procedures, symbols, new words, equations, and most of all a mindset". If we think of technology as a "way of doing something", it is not a question of if we will use technology, but how we will use it. In this regard, Franklin distinguishes between two major classifications of technology. On the one hand are "holistic" technologies which are associated with processes over which someone has broad control over something from beginning to end. In this category are found freedom, creativity and responsibility. On the other hand are "prescriptive" technologies, in which control is centrally held, and functions are analyzed, defined, separated and organized to maximize efficiency. She calls this a "design for compliance", and points out that it can be manifested in political and social terms as well as industrial. If we think of technology as a "way of doing something" then, schooling and education can be seen as a technology, and further, can be manifested as either holistic or prescriptive.

Prescriptive technologies in education are not a recent innovation. Cuban (Teachers and Machines: The Classroom Use of Technology Since 1920) notes that alongside the child-centred reformers such as Dewey, worked the efficiency engineers who
brought an enthusiasm for scientific management in their quest for efficiency. Indeed, the foundations of our modern education system are set in the Taylorism of the Industrial Revolution, where the application of control through the "division of labour" was central to the primary policy objectives of effectiveness and efficiency.

Postman (Technopoly: The Surrender of Culture to Technology) comments on the ecological nature of technological innovation, that is, the way in which even small changes can have profound consequences:

... it is not always clear, at least in the early stages of a technology's intrusion into a culture, who will gain most by it and who will lose most. This is because the changes wrought by technology are subtle if not downright mysterious, one might even say wildly unpredictable ... [but we do know from experience that] new technologies alter the structure of the things we think about... They alter the character of our symbols: the things we think with... And they alter the nature of community: the arena in which thoughts develop.

A consequence that Postman suggests is that through an unexamined acceptance of computer technology we take up the logic and rationality of the computer into our consciousness.

What really counts here?

When we see the enthusiasm that children bring to the use of computer and other entertainment technology both at home and at school, it is difficult to see this kind of engagement as other than positive. But would we go so far as to agree that having fun and enthusiasm about the computer for learning are "really the only things that count"? Should we ask some questions here about the implications of adopting our pop culture's attraction to action and the image as important components of our educational environment?

Perhaps it is just as important to see and remember those same faces as they delight in the narrative of the teacher as "traditional storyteller". Or as students work together on a project, using their hands and voices, talking and listening, asking questions and giving answers; all part of the development of their intellectual and social beings.

The "Principle of Learning" that learning is both an individual and a social process, suggests that there is an importance to the social environment of learning. We recognize this in a variety of classroom strategies that include students working together in a collaborative fashion. This, together with the role that the teacher plays in the class with students individually and collectively, speaks to the richness of the human relationships and interactions that infuse the learning environment.

Should we not be asking questions about how human relationships are changed when they are mediated by technology? What are the long term effects of the
integration of the use of images, animations and models of the world so as to substitute for a physical connection to the real world? Is it really "just like being there?" Perhaps even in a high-tech school there is a place for the traditional art of teaching and a recognition that there may well be good reasons for caution.

As mentioned above, the term "technology" in its broadest sense means a system, or a way of doing something. An examination of the "Technology In British Columbia Public Schools" Report and Action Plan indicates that while a vision is stated in broad terms of "technology", the specific goals in the five year plan are stated almost exclusively in terms of computer acquisition, computer technology and computer literacy. Of necessity, then, much of what we discuss in the short term will concern computers and the related communication devices. However, the issues raised here also have to do with how we organize ourselves, even without the latest "technology".

To repeat Franklin's point, do we organize ourselves in a holistic way, where we design for initiative, responsibility, collaboration, risk taking and achievement? Or do we design primarily for control, and adopt a production metaphor, talking only in terms of units and processes; using a scientific construct as the model of describing reality, rather than only one of the ways of describing life around us.

Enduring Purposes

If we accept that the school system has existing purposes which are not fundamentally altered by the advent of new technologies, then new or old technologies are primarily important only to the extent that they enhance our ability to meet these objectives more effectively. The provincial mandate statement sets out the purpose of the public school system as:

- to enable all learners to develop their individual potential
- and to acquire the knowledge, skills and attitudes needed to contribute to a healthy, democratic and pluralistic society and a prosperous and sustainable economy.

The three basic goals of education, of intellectual development, human and social development, and career development in the British Columbia Ministry of Education mission statement are reflected in the District's Statement of Philosophy, which reads in part as follows:

The Richmond School District is dedicated to providing opportunities for all students to develop the attitudes, skills and knowledge which will enable them to enjoy a productive and satisfying life and to be positive, responsible participants in our democratic society and the global community...

We believe that an effective learning environment should
engage the learner in an active purposeful process of building positive, realistic attitudes towards both self and society; forming personal understandings; developing lifelong skills; and acquiring a strong knowledge base ...

In summary then, the notion of "technology" includes the way we do things as well as the equipment that we use. To concentrate exclusively on the "box on the desk" is to miss the point that we can be prescriptive and narrow in the way we organize ourselves for teaching and learning, even without high tech equipment. Used properly, however computers and related technologies can provide an effective and efficient means to assist schools in meeting their stated goals for all students. The appropriate use of technology requires at least the same thoughtfulness and care which must be brought to all other aspects of district operation and classroom practice.

Foundations For The Future

We believe that the promise of tomorrow is found in "today's" technology plan if the important questions and foundations upon which this plan rest are not lost. Toward this end we wish to recapture our questions and summarize our founding principles. What really counts here? Economic imperatives and technological determinism will not overshadow what we hold to be central human values. We will continue to take the time to deliberate the ethical or philosophical choices to ensure a desirable future.

These are some of the questions we will be asking:

- How are human relationships changed when they are mediated by technology?
- What are the long term effects of the integration of the use of images, animations and models of the world so as to substitute for a physical connection to the real world? Is it really "just like being there?"
- Do we organize ourselves in a holistic way, where we design for initiative, responsibility, collaboration, risk taking and achievement?
- Or do we design primarily for control, and adopt a production metaphor, talking only in terms of units and processes; using a scientific construct as the model of describing reality, rather than only one of the ways of describing life around us.
- Are having fun and enthusiasm about the computer "really the only things that count" in learning?
- What are the implications of adopting our pop culture's attraction to action and the image as important components of our educational environment?
SCHOOL DISTRICT # 11 CURRICULUM INTEGRATION MATRIX

Curriculum Clarification Integration Matrix (K - 12)
This matrix will be followed until the new Information Technology IRPs are made available.
- Problem Solving Applications of Computer Technology
- History and Social Impact of Computer Technology
- Computer Technology Concepts and Operation

Curriculum Clarification
1.1 Math/Science
In the next few years, the everyday experiences of a Math/Science student are expected to go through an evolutionary process that will reflect the changes prescribed in the new curriculum, the developments in technology, as well as the revolutionary changes taking place in the way that research is being done in scientific laboratories around the world.

The number crunching, laborious measurement taking and graph or model generation will shift increasingly to machines that may be as simple as a hand held calculator or as complex as a computer that can create sophisticated simulations. Students will be less dependent upon teachers as mainsprings of knowledge and managers of their education and more likely to be travelling unique paths through a series of educational experiences. These unique paths will be dependent on student interests, aptitudes and learning rates. In such an environment, technology will be able to provide students with individualized learning activities appropriate for their skill and interest level at a given time.

The Math/Science student should have access to a rich supply of up to date information via on line databases. In the lower grades this may take the form of CD Rom Encyclopedia Disks in the Library and/or in classrooms. In the higher grades students will need to be able to access external databases of information via satellite or modem connections. Students will use interactive laser video with increasing frequency as the libraries of video disks increase in scope and size and as the hardware becomes more readily available and easier to use.

Students will turn to computers for computer assisted or managed learning. The computer instruction will be interactive and responsive to the rate of student learning. Topics might be as narrow as estimation with metric measurement or as expansive as beginner's calculus. The computer will provide students with the opportunity to address data analysis in an efficient and meaningful way. Costly, dangerous or tedious scientific laboratory experiments will be carried out via computer simulation as is becoming common place in real world. Students will be able to graph experimental results quickly to assist them in formulating theories and conclusions. Math students will make increasing use of graphing calculators and programmable calculators in the higher grades. Students in all subject areas are already showing the invaluable role that computers can play as a processing and
publishing tool whether it be basic word processing, complex electronic spreadsheets or illustrative art work. These uses will continue to grow where feasible and appropriate. Students may soon begin to use small, portable computers as electronic notebooks in which they can store key concepts, principal formulas, as well as keep record of dates and commitments.

Math & Science teachers are finding computers linked to Overhead Projector Monitors invaluable instructional aids. The whole class can share in the derivation of a solution, a simulation or the testing of hypotheses. It has become an efficient vehicle for pooling class data such that a large group can gather information, collate that data and collectively examine it for relationships in only a fraction of the time that individuals could do so. The multimedia dimension has empowered many teachers to bring a more complete and enriching experience before students addressing the need for more multisensory learning.

This same computer used for large group demonstrations and presentations Will be used as the teacher's primary record keeping device. It will be used as a tool for test preparation and generation as well as for attendance, evaluation and reporting. In a fully networked environment, it would provide staff access to important demographic information on his/her students. if learner profiles are going to be effective guides to direct staff and students into new areas of learning, teachers will be required to have constant access to them. For this, each teacher must have discretionary access to a computer and the learner profile database.

This is not a brave new world, it is simply one that reflects the changes that have taken place in business and government offices and research labs in North America over the past five years.

1.2 Humanities

Humanities teachers (Primary through Graduation) in the District support the stated directions of the Technology Position Paper, particularly as it relates to easy access to word processing, obviously essential for the Humanities strand.

Word processing is one of the -best understood areas vis a vis the impact of computers on learning. Educators and researchers recognize that motivation to write more is inextricably linked with the development of writing skills and that word processing offers a unique way of serving this need. In addition, many parents recognize the value of word-processing in particular and computer assisted learning in general and express considerable frustration when their children do not have enough access time.

Contrary to some fears that computer use results in learning in isolation, Humanities teachers observe that it promotes cooperation. Students develop peer-support networks which facilitate group or individual learning. The student-centered classroom is much more easily realized.

Humanities Classroom Needs:

- Primary: 2 computers per classroom.
- Early Intermediate: 4 computers per classroom in addition to an instructional lab tied to a Resource Centre. This lab should accommodate 30 students. Teachers
will require regular access to computers as well, preferably at each teacher's desk.

- Intermediate (currently Middle School): 3 computers per classroom networked to labs within the school. Each teacher will require a computer, via classroom and teacher work area access.

- Late Intermediate and Graduation: 3 computers per classroom networked to labs and the Resource Centre, with access to electronic data sources. Each teacher will require a computer (and Overhead Projector Monitor), via classroom and teacher work areas.

Computer technology constantly astounds us with its evolution. Changes occur much faster than we can anticipate, but students who are comfortable with and users of technology will more readily accept technological changes. At the same time, Humanities teachers emphasize that a process approach to learning can be applied to changing content. Students come to recognize that change is a given in the field of human endeavour, that they are part of the change, as are the tools that they use to enhance their learning.

1.3 Practical Arts
Home Economics:
The Home Economics teachers of School District 11 (Trail) support the philosophy statement of the Technology Position Paper. Computer use will support and enhance student learning in the following ways. These are not prioritized, nor is the list comprehensive.

Tourism industry, including hotel front desk programs, reservation systems and restaurant management systems; simulations and case studies, especially in Family Management; data base including family in other cultures or costing of ingredients; nutrition games, including concepts in healthy eating; recipe costing and cross referencing; nutrition/lifestyle analysis; meal planning/meal patterns; computer managed learning; pattern drafting/fashion design/wardrobe planning; lesson aides for remediation (absentees and review); individualized enrichment, information access; word processing.

Teacher administrative uses include inventory control, student assessment, evaluation, reporting, and personal productivity.

The Primary, Intermediate and Graduation Practical Arts curriculum documents are currently being written. It is anticipated that certain specialized equipment will be required. Example include computerized sewing machines and computerized microwave ovens.

Technology Education:
Technology Education is undergoing a revision in British Columbia in a way which retains the solid core programs of Industrial Education while encompassing programs which focus on design and process oriented learning. While this problem-solving/design model will see its greatest impact in the Intermediate years, significant changes will continue to occur at the Graduation level with technology becoming an integral part of drafting, automotive, woodwork and metalwork.
Ministry Technology Education curriculum documents are forthcoming, but it is clear that the models adopted in North Vancouver, Burnaby, Revelstoke and other progressive districts will become the norm. The traditional core areas will remain in new curricula, but we will see computer-assisted design, robotics, electronics and manufacturing throughout the Intermediate and Graduation years. Also included will be computers as simulators of human activity via multiple lathes, sprayers and other mass production devices which students should gain familiarity with.

The activities described in the Intermediate and Graduation computers learning activities section of the position paper will become commonplace and expected in schools. These include computer assisted drafting, simulations, numeric control of machines, interface between computers and machines, and student productivity as in other curriculum areas.

Physical Education:
Computer use can be beneficial to students in a Physical Education program, as a key component of the instructional process.

Students uses will include:
- fitness analysis; nutrition and diet analysis; skill correction and analysis;
- data bases for related work fields and sport in other cultures;
- computer assisted learning, especially with interactive video disk, for advanced study, remediation and absentee make-up; information access;
- word processing; related games.

Teacher administrative uses would include inventory control, assessment, evaluation and reporting, as well as personal productivity. Specialized equipment will undoubtedly be required under the direction of the Intermediate and Graduation program documents. Fitness related equipment such as computerized stationary cycles and rowing ergometers will be expected, as will personal lifestyle measurement and analysis equipment.

Business Education:
Trail Business Education teachers support the Technology Position Paper. Computers are and will continue to be an integral part of any Business Education program.

Business Education will present itself in the Primary and Early Intermediate Programs through keyboarding, word processing and data analysis. In Late Intermediate, all grade 9/10 students are currently taking keyboarding, data processing or Business Education. This will continue under the new expectations of the curriculum. By our calculations, each Trail secondary school will require the equivalent of one full lab for grade 9 and 10 students alone.

At the Graduation level (grades 11 and 12), each school will require at least half-time access to a computer lab of 30 work stations plus peripherals. Data processing II and 12, Information Management 11 and 12, Marketing, Economics and Business Management programs will all require ready and regular access to sophisticated computer facilities.
1.4 Fine Arts
Rationale: Technology is a curriculum resource for general application among all strands and subject, and shared by students and teachers.

Information Technology resources should complement the other teaching tools and strategies in learning, not being financed and put in place at the expense of other program needs, but rather as a part of the whole vision of resources for teaching and learning.

Computers fulfill many roles in fine arts, including: musical composition, arranging and sequencing; drill, review and practice in music theory; lighting for presentations and theatre productions, drafting for theatre set design; scriptwriting, editing, journalism; graphic design and publishing; printing and publishing for performances; individualized study and research; multimedia presentations; video editing.

Computers which have capabilities in graphics (including colour) and sound are essential for learning in the Fine Arts strand. As technology improves, more fine arts students will be able to take advantage of computers for activities such as colour improvements, 'elaboration' language rendering for dance, animation, synchrony and video simulations.

Accessibility:
Each classroom should have two computers plus regular access to a lab. At Crowe, for example, the need for lab access can be demonstrated by the following: the Graphics class uses the computer lab for 30% of its work; Art classes use computers for 100% of their work; Creative writing 12 is scheduled into the lab for 30% of their work; Music composition is scheduled into the lab for one block each day during a full semester. Peripherals are brought into the lab.

Requirements for Fine Arts:

1.5 Students with Special Needs
Students with special needs are those who have been identified as requiring individualized programming, curriculum adjustments and/or additional support services in order to reach their individual potential. As stated by the Ministry of Education, included may be those students who have: exceptional cognitive abilities; visual, hearing, physical or chronic health impairments; speech and language disorders; severe learning disabilities; mental handicaps.

Rationale:
In recent years, more special needs students are being served in the public school system. This has been due to the closure of many specialized institutions, medical advancements, and the shift in society's philosophy and expectations for students with special needs. Also there has been a progressive
increase in the integration of all students with special needs. Specifically, changes in
The School Act and the new curriculum documents have added to the impetus for
integration.

Computer technology for special needs students would not be viewed as simply
desirable, but rather as essential to their individual educational programs, a perfect
example being the use of lap top computers for learning disabled students.

"Opportunities to use appropriate computers and related technologies are available
to students throughout their education, beginning in the primary years." (Primary
Foundation Document)

Technology allows students with special needs to focus on their abilities, rather
than focusing on their disabilities. For example, word processing for many of these
students is their writing process, not simply a support. Educational technology
allows students with special needs to participate with greater independence in the
regular classroom setting, thus facilitating their meaningful involvement in the
primary, intermediate and graduation programs.

Needs:
Student specific needs include: adapted keyboards; switches; speech synthesizers;
lap top computers; specialized software; augmentative and alternative
communication devices; enhanced monitors; adaptive firmware cards.

Ongoing Teacher Inservice:
The field of technological developments to assist students with special needs is ever
changing and dramatically improving. Teachers and support staff have to be aware
of the equipment that is available, and then be trained in ways in which the latest
technology can improve opportunities for students.

Teacher Use of Computers:
Due to the individualized nature of teaching students with special needs, teachers
who work with these students require equipment to assist in the design,
organization, implementation, and monitoring of individual educational plans and
other required record keeping activities.
Implementation

Implementation strategies are divided by sections representing short, medium and long term goals. After each set of goals, a corresponding set of actions and implementation strategies are given in order to meet the desired goal.

Keys to Successful Implementation

Two concepts are critical to the successful implementation of technology in the district. The first is to ensure that all school level stakeholders are involved in the decision-making process. This can be achieved through the creation of School Technology Teams. The second is to define an initial implementation strategy which encourages some schools to pilot new technology and corresponding educational strategies. It is intended that, as the rest of the schools in the district begin implementation, they will learn effective implementation processes based on the experience of these schools.

Technology Teams

School Technology Teams

For technology to be successfully integrated into the instructional process and positively impact student achievement and performance, it is critical that all stakeholders support the process. Therefore, each school will create a School Technology Team (STT) comprised of teachers, parents, students, principals, business partners and educational partners. Each STT will be responsible for making decisions regarding technology selection and acquisition, implementation, designing and delivering inservice, establishing school-based technology projects, and evaluating technology implementation and application by staff and students. Each school principal will include technology in the annual School Growth Planning process in order to respond to the school's technology needs and to access necessary funding. The concept of School Technology Teams fits well with the focus on school-based decision making within the district.

District Technology Team (DTT)

A core of representatives from each STT, or from each zone of STT's, will establish a District Technology Team (DTT). The DTT will be comprised of representatives from the School District Office, schools, parents and the community. Conceivably, most members of the DTT will also be STT members. The STT's focus on implementation is at the school level; the DTT will coordinate and monitor the implementation of the Technology Plan and develop strategies for district-wide implementation of emerging technologies. Further, the DTT will advise STT's on standards and expectations for technology implementation, as well as revise the Goal Statements of the Technology Plan as needs change and as the technological and educational environments in the district change. The DTT will also prepare and
present an annual report to the School Board regarding the status of technology implementation throughout the district.

Goal for School Technology Teams
To develop a School Technology Plan which is designed to support the directions and achieve the goals stated in the District Technology Plan, and which includes:
- guidelines for the instructional use of technology
- curriculum-based strategies for the utilization of technology
- goals and objectives for student skill development
- a plan for local technology inservice for staff which will enable staff to achieve the guidelines, strategies and objectives outlined in 1-3 above
- funding options for technology acquisition and staff development programs
- a plan for regular re-evaluation and revision of the School Technology Plan

Pilot Projects
Implementation of the Technology Plan will be facilitated through the concept of Pilot Projects. Pilot Projects will be located in schools where successful implementation of technology will be highly likely. In other words, schools selected for Pilot Projects must demonstrate a commitment by the staff to test and implement new technologies, and to explore and adopt new instructional models and methods. Their role will be to pioneer technology-based, innovative, educational methods designed to improve teacher and student productivity and achievement. These schools will be expected to share the knowledge gained through the Pilot Project. Based on these experiences, a decision will be made by the DTT regarding technology implementation in the remaining schools.

Schools who wish to meet the challenge of hosting a Pilot Project will make an application to the DTT, accompanied by a proposal explaining how implementation of the Technology Plan will take place within their schools. The district will make the commitment to providing funding for the Pilot Projects both for technology acquisition, and for inservice and support for the staffs to learn new technology and instructional skills.

Pilot Project
A plan will be required which assesses the implementation process of each Pilot Project and which ensures that issues are addressed as they arise. Evaluation procedures should also assess the school's success in moving toward improved efficiency in school operation, improved cost effectiveness and improved teaching and reaming experiences within the school.

Steps For Securing Pilot Projects
Schools wishing to host Pilot Projects will:
- form a School Technology Team;
- write a School Technology Plan which supports the District Technology Plan;
- negotiate commitments, expectations and outcomes with the DTT;
evaluate and document their implementation of the Plan;
keep the DTT apprised of the success of their implementation processes;
provide How To. information designed to help subsequent schools in their successful implementation of the Technology Plan.

**Learner Goals Implementation**

**Immediate Goals**

1. Inservice will be delivered to reamers using the principle of active participation.
2. Training and inservice programs will be developed to aid in implementation of technology.
3. All staff will learn basic computer operation skills, and learn how to integrate computer use into their daily tasks.
4. Technology will be used to perform routine tasks in an effective and efficient manner.
5. All teachers will learn how to integrate computer and educational software use into their teaching activities and their curricular goals for their students.
6. Students and staff will be encouraged and assisted in being current in the use of technology.
7. Staff will model uses of technology based on ethical principles and respect for privacy.

**1) Teacher Inservice:**

Each school will support the inservice of its staff members who receive new technologies for their professional use. Inservice programs will be designed, directed and delivered by the School Technology Team (STT). Staff training will commence immediately upon acquisition of new technologies, and be sensitive to the range of knowledge and skill levels which will exist within each school's staff.

**Implementation Strategies**

Teacher inservice in the use of technology will be an ongoing program involving initial introductory training followed by training in the specific applications of technologies and software.

The district will state an expected level of use and/or achievement regarding teacher and student involvement in the implementation and application of educational technology resources. In support of these expectations, inservice programs will be designed to incorporate a majority of active reaming or 'hands-on' strategies and activities to help teachers in learning new technology skills.

**2) District Standards and Expectations:**

School District No. 57 (Prince George) and the DTT will establish district-wide standards for technology use and achievement for staff and learners. These standards will provide direction for the STT's in their designing of school-based inservice programs.
Possible Expectations for Teachers’ Use of Technology
To be able to competently and confidently operate the technologies available to them in their school
・ To use the computer as a time-saving productivity tool
・ To track student progress and mastery of curricular goals
・ To correlate and integrate technology use with the curriculum and existing instructional materials
・ To extend and enhance ongoing curriculum objectives
・ To expand the quality of student learning activities and teaching aids
・ To use computers to offer personalized/individualized instruction
・ To teach students to use the computer both independently as well as in cooperation with others
・ To empower both the teacher and the student, placing them in control of their own learning and growth

Implementation Strategies
Each STT will strive to support its staff in achieving the district’s standards for technology use. The School Technology Team will define its inservice plans to meet this objective in its School Technology Plan.

3) Implementation Information Exchanges:
A communication mechanism will be established by the district to provide a vehicle for STT’s to share concerns, ideas, lessons learned and successes.

Implementation Strategies
The information exchange mechanism can initially be as simple as a monthly meeting of representatives from each STT within each zone and/or a monthly meeting of STT representatives from each zone. When schools are able to communicate using electronic mail, the communication mechanism will include an electronic bulletin board or conference for information exchange. Implementation information exchanges will enable STT’s to learn from the experience of other teams as they begin to select or implement new technologies.

4) Ethical Principles:
Policies regarding the ethical use of technology will be generated by the district. Staff will be expected to teach the issues and related policies to their students and will know the course of action to take if problems arise.

Implementation Strategies
Inservice will include training on the ethical uses of technology. Staff will be apprised of technology-related issues involving copyright, freedom of information, privacy, and the appropriate educational use of telecommunications and database
access. Staff will be expected to model technology use which recognizes legal, professional and ethical standards.

Supporting Information

1) Staff Inservice Objectives:
Introductory and Intermediate - Computer Operation and Daily Tasks Application
The staff in each school hosting a Pilot Project will receive new technologies. (An example of initial technology acquisition could be computers for classrooms and work stations.) Staff will engage in an intensive inservice program upon the receipt of new technologies/computers. The introductory level of inservice should focus on teaching staff members how to:
• operate the computer,
• use it to connect to the LAN in the school,
• integrate computer use into their daily tasks, and
• perform routine tasks in an effective and efficient manner

The intermediate level of inservice will expand upon the entry level skills acquired in the introductory stage of technology use. Intermediate use of technology will focus on a more expanded and integrated application of technology to increase efficiency in performing daily tasks. The primary objective is to obtain maximum value of utility from the technology with the aim being to save teachers time.

2) Curriculum Application Training:
Advanced - Integration into Curricular Goals
Once staff have reamed how to operate the computers and use the computers and the Local Area Network to perform routine tasks, subsequent training should focus on staff members reaming strategies for the integration of computers and educational software into their teaching activities and their curricular goals for their students. The form and content of staff training will vary because of the different contexts between elementary and secondary schools. Inservice will also vary depending on the educational software needs of the teachers and students within each school. Needs assessments for each school must be conducted prior to the designing and delivery of inservice.

Learning how to share learning resources and to reduce the amount of 'paper generated' communications within and between schools should be a priority for staff inservice. As new resources become introduced to the school (new productivity software, new educational software and CD-ROM's), inservice should be designed to train teachers how to use them and incorporate them into their educational activities.

Note: For further information on Staff Inservice, please see 'Inservice Training' in the Related Key Areas Section of this document.

Mid-Term Goals
1. Technology will be used to enhance the opportunities for the inclusion of students of all abilities.
2. Teachers will use technology to meet the reaming styles and needs of individual learners.
3. Technology will be incorporated to promote teamwork and cooperative enterprises amongst learners.
4. Teachers and students will have the skills, and develop a positive attitude, for the use of technology as a tool for learning.
5. Technology will be used to expedite the generation and access of student data.
6. Student interaction with technology will occur in school and community settings.
7. Technology will be used to promote communication and collaboration of teaching professionals and educational partners.
8. As technology is an evolving tool, the Plan and its implementation will undergo continuous evolution to incorporate emerging needs and technology.

1) Student Needs:
Action Items
As part of the ongoing school-based inservice program, the STT's will design staff inservice programs on how to use technology and educational software to:
   a) include students of all abilities;
   b) meet the reaming styles and needs of individual learners;
   c) promote teamwork and cooperative enterprises between learners.

1. Implementation Strategies
STT-coordinated inservice for staff will be an ongoing program which will include a focus on training teachers to continually expand their technology skills, as well as to be skilled in the most current uses of the technologies available to them. Teachers will incorporate into their curriculum the teaching of current technology skills.

2. Inservice Training
The purpose of this Plan is to evolve the current situation into an improved educational environment to benefit all stakeholders in the educational process. Change involves commitment, time and risk. It also requires an understanding of the critical vehicles for facilitating change within the school system. A successful approach to implementing technology-based innovation is to ensure that, in conjunction with changes made to the technology environment, staff is prepared with appropriate knowledge, skills, attitudes and resources to support and implement the required changes. Staff involvement, development and support are the keys to implementing and sustaining a new environment. The quality and success of any school program largely depends on the support of well trained and committed teachers and support staff.

Change can also be mandated by the district introducing expectations, standards and policies to ensure that "things are done differently around here". However, the likelihood of implementing change successfully using this method is remote in today's environment.

Some changes will occur simply in response to the acquisition and introduction of new technologies and services which may contribute to students obtaining a better educational experience. A small portion of the potential benefits will be realized, however, if this is the only step taken in the change process. The successful
introduction of modern technologies into a classroom also requires changes in content, methods of teaching, expectations and ways reamers, and ways of evaluating teachers.

Successful implementation requires time and money. Process make take from three to five years and, within the environment of continuous technological change, it is likely going to become a continual process of updating and refining.

It is difficult to generalize on the amount of time that should be allocated to this development process. How much is the responsibility of the district and how much is the responsibility of individual teachers?

Although some "high tech" businesses in Canada allocate 15-20 days of training per year per employee, it should be noted that, by international standards, Canada allocates a relatively small percentage of its work time for training of employees. Many companies reimburse employees for taking job-related courses on personal time.

Rather than increasing the demands currently placed on the school district, it is suggested that inservice training be provided to staff from a variety of sources. For example, inservice can take place during the school year (using resources internal and external to the district), and summer technology camps, summer institutes, and district-paid external training courses could be offered. Pro-D and community interaction days (encouraging parent and business involvement) are also possible sources of creating opportunities and time for training.

All training programs must involve teachers, administrators and business partners in establishing goals, program design and, whenever possible, sharing in the delivery of training. Program involvement and ownership by all stakeholders, and follow-up coaching and feedback, are all critical success components to staff inservice.

An additional option is to organize an STT-based inservice program where each teacher possesses specific inservice responsibilities for his/her peers. As part of their professional responsibilities, all teachers would thus be expected to maintain up-to-date knowledge in their inservice specialty area and serve as a mentor for their colleagues. Funds should be provided to these mentors to assist them in maintaining current knowledge and skills.

2) Generation of, and Access to, Student Data:
As part of the ongoing school-based inservice program, the STT's will design staff inservice programs on how to save time through the use of computers for record keeping, marking and writing report cards. School and district staff will learn how to use computers to efficiently store and access this information.

3) Positive Attitude Towards Technology:
Technology in schools will be perceived by the district and staff as a tool to facilitate regular teaching and learning activities, to create new educational opportunities, to enable students to learn required technology skills, and to aid in the efficient
operation of schools and the district. Staff inservice training will be designed to be sensitive to the needs of learners so as to promote a feeling of comfort and confidence in the use of technology.

4) Technology in School and Community:
Students will interact with, and learn from, technologies both within their schools and within their community. As a Wide Area Network is established throughout the district, students' learning will be able to take place both within, and external to, the school building.

Educational partners, such as businesses and post secondary institutions, will be accessed via a Wide Area Network. Wide Area Network channels will facilitate the delivery of distance education.
SAMPLES OF INSERVICE PLANS

In-Service...$5250
Expert Speakers (In conjunction with professional development and staff
development committees
• Topics to be decided by school technology committees.

Release time (it is our recommendation that we piggy-back on the TIP program
currently operating in the district. As courses are given, allow some release time for
lesson demonstration and support as follow-up to the in-service sessions. A type of
mentorship which supports the use of newly learned skills.)
• ClarisWorks in the Classroom
• HyperCard in the Classroom
• Desktop Publishing
• Internet Resources
• Netscape
• E-mail systems and e-mail use

Lesson Plan/ Curriculum Integration Resource Packages. (Release time given to a
teacher to collect, organize and distribute unit plans with lesson outlines, projects
and similar resources for all levels of students-4-5 release days to be used by the
teacher developing the resource packages)
• Projects for students
• Internet resource areas
• Scope and sequence integration
• Curriculum integration ideas for all levels. (S.D. #14)

District In-Service Plan

Purpose of the Project:
1. To meet growing needs for staff technology training.
2. To support a model in which the skills of in-district personnel are strengthened
   and valued as an important staff development resource.

In order to effectively use hardware and software, appropriate emphasis needs to be
placed on teacher training.

Teachers will require release time for:
1. attending computer conferences
2. learning how to use new computers/technology
3. developing skills in using a variety of software packages
4. developing content/methodology skills in order to integrate computer/technology resources into curriculum

Teachers could receive this training by:
1. attending district sponsored in-service after school or during the teaching day and attending technology conferences.
2. enrolling in:
   a. credit courses
   b. evening courses
   c. personal study

Appropriate District Inservice money should be allocated within the district to achieve the goals outlined above. Professional and support staff may also use association/union Pro-D funds. The second year of an employee computer purchase plan has been successfully completed. This has offered an affordable program for district staff to purchase equipment on an district payroll plan. We encourage this program to be on-going.

As Lake Cowichan School District continues to improve it's technology hardware and software base for instructional, administrative, and support staff, and as professional staff endeavour to integrate technology across the curriculum, district employees will need a level and intensity of staff development not possible with current resources. The following plan (to begin in the 1995-96 year) is designed with the intent of providing all of our schools with high quality staff development at a limited expense to the district. It is also designed with the intent of building a staff development in which the expertise and presentation skills of in-district personnel are strengthened and valued as an important staff development resource.

The staff development plan involves the formation of a technology-related Staff Development Team consisting of staff developers, or trainers, who are knowledgeable about adult learning theory, familiar with current computer-
mediated technology, experts in specific content areas, and who are skilled workshop providers. The District Technology Committee will oversee as well as actively participate in the on-going development of this model. The initial step involves selecting members to serve as Staff Development Technology Trainers.

Selection will be based on the following criteria:

- Delivery skills
- Interpersonal skills
- Computer expertise
- Content area expertise
- Ability to commit time and energy to staff development

The team of trainers should be diverse in instructional areas of expertise:

- Special Education
- Primary
- Intermediate
- Secondary
- DOS/Windows experience
- Macintosh experience

The District Technology Committee will determine classes to be offered during the school year based on several criteria. These criteria will include the long-range goals for technology in Lake Cowichan School District, specific requests from staff members, and requests by site-based teams.

Compensation provided to the trainers will be offered in the following formats:

- Release Time - A team member could request substitute time, with principal or supervisor approval, in order to observe other technology programs relevant to their assignment; or to attend training or conferences related to technology
- Technology Conference Travel and Registration Fees
• Purchase of Job-Related Technology - this would typically be computer or multimedia software or hardware that will help the team member do a better job with students. The District would retain ownership of these items, but may assign them long-term to the team member whose resources made that particular purchase possible.

District financial responsibility for this program will include training and support of team members. Funding to come from District Technology Inservice and District Staff Development. Evaluation of the workshops will be an on-going responsibility of the District Technology Committee. (S.D.#66)

Staff: Professional staff and teacher assistants are critical in supporting students with the effective use technology. Technology is most beneficial to the student if the teacher's style is one of a facilitator of learning. Although teachers need not be technical experts they need to conceptually understand what the tools are capable of and the range of information and resources available on the various systems. To help them develop this understanding and keep up with the ongoing changes, schools need to identify a professional staff member for peer-to-peer training and implementation support. Para-professionals or teacher assistants will be the technical experts who will set up, manage, troubleshoot and maintain, the hardware, software and networks in each school. Some existing staff members' roles and responsibilities will need to be redefined to support this new structure. The use of ILS can free staff of the more mundane tasks thus giving them more time for peer-to-peer interaction and for facilitating student learning. Over the long term with the shifting of staff roles, no addition staff should be required to operate this new structure although the initial start-up operation may require some additional staff time to bridge the transition process. Short term funding for additional staff time should be targeted. (S.D.#61)
"The challenge of integrating technology into schools and classrooms is much more human that it is technological. What's more, it is not fundamentally about helping people to operate machines. Rather it is about helping people, primarily teachers, integrate these technologies into their teaching as tools of a profession that is being redefined through the ...process."

Barbara Means et al.,
Using Technology to Support Educational Reform

Although many people view educational technology as synonymous with computers, technology also includes the vast array of expressive, receptive, and presentational devices available for use with computers, including interactive video, optical media such as CD-ROM and CD-I, networks, hypermedia systems, workgroup collaboration tools, speech recognition and synthesizers, image processing and animation and of course, software more generally. We must also include VCRs, televisions, telephones, video and still cameras, audio devices, calculators and other hand-held devices, microcomputer-based lab equipment (such as sensor probes and measurement devices), as representing technology which belong in the classroom. The introduction of these new and old technologies into the classroom raises many questions around how teaching, the curriculum, and our students will be affected as well as questions about how teachers will gain the knowledge and skill base needed to bring the vast array of technologies into the schools.

In the enthusiasm to introduce students to these new technologies with obviously limited resources teacher issues have often been shortchanged. The emphasis has often been on short term training to familiarize teachers with a specific application giving the mistaken impression that general computer literacy has been achieved. What about the instructional methods, teaching styles, working and assessment procedures and the organizational characteristics that must accompany the technology if it is to be integrated into today's classrooms and school culture? If schools are to use technology effectively, what structures have to be in place to support teachers in becoming skilled users of technology?

Professional development is a general term, often used interchangeably with staff development or teacher training, to indicate the structured or unstructured process by which teachers already in the classroom expand their knowledge, skills, abilities, or experience to further their effectiveness. On the one hand, it is correctly seen as the central strategy for improvement. On the other hand, it is frequently separated artificially from the institutional and personal contexts in which it operates. In Richmond we have encouraged professional development as a method of culture building within the individual schools. Our district professional development calendar reflects our belief that it is our collegial and collaborative growth and practice which differentiates our district and supports our teachers as professionals. We seek to develop structures to enable teachers to collaborate with colleagues and participate voluntarily in their own renewal and the renewal of their schools.
Support staff encounter many of the same issues in dealing with new technologies. The Richmond School Board and the Technology Planning Committee share a common concern about the time and the energy all staff will require to learn about these new technologies. Teachers are already facing a staggering array of relatively complex curricular reforms and experiencing multiple competing demands for their limited staff development time with the many different kinds of school-based reforms which are underway and require new learning or expertise by today's practicing teachers. Support staff face increasing demands to maintain student data and to communicate via electronic means. We believe that helping all staff may, in fact, be the most important step to helping students.

The most typical ways teachers upgrade their skills are by taking credit courses on their own at local universities, attending a noncredit continuing education course or attending inservice courses or activities put on by their local school or district. These inservice activities are viewed as a vehicle to enhance teaching, and provide new information (often entry level) to teachers. Too frequently, inservice training entails a single workshop or course for a group of teachers, with the assumption that "one-shot training" is all teachers need to apply their newly acquired skills, content, or techniques in the classrooms. Support staff attend workshops and receive informal assistance and training from the District's applications trainer in addition to self directed learning. Yet research has suggested that individuals learn best, not from isolated workshops or lectures by experts, but by seeing methods used in actual classrooms and the work place, by trying out new techniques and getting feedback on their efforts, and by observing and talking with their colleagues. Professional development may work best when schools create working conditions for teachers and support staff that foster continuous learning and professional growth, such as providing opportunities for teachers to reflect on their teaching practice or to refine ideas with colleagues.

We fully realize that addressing the irony that the preponderance of teachers who will use the technology in their classrooms do not as yet have ready access to the technology or 'just in time' training and technical support will take many years to achieve. It is our intention to use the suggestions and input from the members of the Technology Planning Committee, the Technology Advisory Group, established teacher networks and the Richmond Teachers' Association / Richmond School Board Joint Professional Development Committee to suggest direction on a yearly basis the plan for district professional development. Educational rationale should guide all technology decisions. The views of all staff are essential when developing technology plans whether thinking through the goals for technology use at the local school site or deciding on directions at the district level.

**Guiding Principles for Professional Development and Technology Implementation**

The investment in technology includes an investment in human resources. Training, maintenance, technical support and time to learn to use the technology are to be constant, continuing, and key priorities in budget considerations.
Employees cannot use technology without systemic support. The roles of principals, other administrators, and the community are critical in fostering sustained use of technologies. District staff will work with schools to provide motivational support for teachers, parents and the community.

When it comes to learning to use technology, "hands-on" training is a necessity. All staff must have the chance to make the computer (or camera or calculator or......) work, and gain confidence in their own competence, before they try the same thing with their own class or work task.

Access to equipment is essential. It is extremely frustrating for teachers to learn to use technology in a workshop, then return to a classroom where the technology is not readily available. Richmond district staff will explore ways to increase teacher access to technology. Currently this is done through the Employee Professional Development Computer Purchase Plan at the teachers' own expense with after tax dollars.

Follow up support and coaching is as essential to effective staff development as is the initial learning experience. Individuals don't "learn it all" at a training session even if it extends over several weeks. When they return to the classroom or work place the unexpected inevitably happens. At this point, all staff need to be able to reach out for technical assistance and support. The means to access technical assistance and support will be made clear to all district employees.

Technology-rich sites do not guarantee the integration of technology into the curriculum. Curriculum integration is central if technology is to become a truly effective educational resource, yet true integration is a difficult, time-consuming, and resource-intensive endeavour. Through the work of established teacher and employee networks and the Learning Services Department the district will support pilot projects for the exploration and evaluation of new technology resources.

When conditions are right--resources, time, and support are high--exciting things happen in technology-rich environments. Nevertheless the reality of reduced budgets, equipment shortages and scarcity of trained staff lead us to pose the more likely questions of how the lessons derived from technology rich environments can be translated into classrooms when resources aren't as rich? This will require the identification of the critical issues and the development of policies as a result of reviewing the development of products based on research and the experience of experimental/pilot sites, as well as seeding more "real world" projects, and the dissemination of lessons learned.

**Teachers Learning With and About Technology**

Using technology with facility is a daunting challenge for most people and teachers are no exception. Activities can vary in intensity and strategy from one-time training that acquaints teachers with a single application to ongoing support that
helps teachers understand how using technology can change teaching styles, classroom management and instructional techniques. Technology requires new skills and most likely new teaching approaches. Encouraging teachers to use technology will require hands-on training with hardware and software, curriculum specific applications and follow-up support. In an ideal world this training and support would be achieved without teachers having to leave their schools for staff development.

**Guiding Principles:**

- Pedagogical issues will be addressed in tandem with subject-matter training.
- Professional development will be based on solid research about effective teaching and learning.

Learning from some of the shortcomings of past training efforts we see the benefit of addressing local organizational conditions in the design phase. We suggest that pilot projects require administrators to participate in training, encouraging teams of administration, clerical staff and teachers to participate together, requiring school funding contributions, or asking administrators to agree up front to provide certain support after staff return from training.

Richmond district will continue to seek and develop new organizational arrangements for training teachers, such as field-based training or collaborative training involving other school districts, universities and colleges as well as other possible partnerships assuring support for teachers over the long term not just when technology is brought in the door.

**Educational Equity**

Providing comprehensive training at a level that could make a significant difference to every staff member is likely to be beyond the range of available funding. Yet equity concerns raise an argument against focusing efforts on the already well-positioned, even if they as leaders can have a broader impact by sharing their experiences with others. A related key issue to consider is who should have priority for technology-related training: Should resources concentrate on supervisors, teacher-leaders, support staff, or on those most in need of improvement? On math and science teachers, since technology applications are proceeding rapidly in these fields, or on humanities and other fields, since they have been somewhat neglected to date? On specialists who work with children most at-risk, or on "regular" teachers who work with all children? On elementary or secondary school teachers? On clerical staff and Classroom Assistants? These questions will direct our professional development plans for the year/years to come.

"... equity is concerned with the promotion of personal, social, cultural, political, and equality for all who participate in the
The education system of British Columbia. The term "gender equity" emerged out of a growing recognition in society of pervasive gender inequities. Continuing traditions of stereotypical conceptions and discriminatory practices have resulted in the systemic devaluation of attitudes, activities, and abilities attributed to and associated with girls and women. The negative consequences of stereotypical conceptions and discriminatory practices adversely affect males as well as females.

Ministry of Education Publication from the Web

If equity issues are not surfaced openly then too readily will technology become another source of power differentiation within the schools. Therefore when workshops are offered at the district or school level attention will be given to who the attendees are. Representative balancing includes gender, curricular area, administration, teaching and support staff, and in some cases, students and parents. Night school, Saturday and after school courses have some drawbacks for many with family and caregiving responsibilities. In the interests of educational equity there should therefore be some responsibility on the part of the district to provide opportunities for those who otherwise would be denied access to training.

**Guiding Principle:**

Equity issues will be addressed in the delivery and content of staff development.

**Recommendations: - Staff Development**

1.1. That the Director of Technology and his staff will offer to help organize multi-school staff development programs in the area of technology for those schools whose Professional Development days fall on a common date.
1.2. That the District will explore the development of in-service opportunities and research internships with universities, colleges and/or businesses.
1.3. The District will maintain and publish for reference a listing of pilot projects and exemplary examples of the use of educational technology.
1.4. That a collaborative venture between the universities and the teacher preparation programs be explored whereby course work could be offered in our schools with positions guaranteed for our teachers for credit or not for credit.
1.5. That the District develop a planning kit for assisting schools in the development of their Technology Plans.
1.6. That the Director of Technology and his staff work with the Learning Services Department to integrate technology into district and school-based workshops.
1.7. That the district research the feasibility of establishing a teacher center to support teachers with access to equipment, resources and training in using technology.
1.8. That the district put in place a support structure to help those teachers who wish to apply for grant money for projects which integrate the use of technology.
1.9. That the District work to ensure that there is equitable and representative distribution of training and access to technology.
1.10. That the District establish summer workshops for staff around the use and implementation of technology.
SCHOOL DISTRICT # 9 REVIEW OF TECHNOLOGY APPLICATIONS

A) Curriculum/Teaching/Learning:

i) Primary:

Many primary teachers use computer technology to manage their records, develop learning materials and communicate with parents. Students are provided computer experiences which provide drill and reinforcement activities in mathematics and science. Students use computers and learning software which teach, drill and reinforce mathematics concepts, seek and search for information, to solve problems and use thinking and reasoning skills. Reading, writing and thinking are nurtured by a combination of teacher developed learning programs which use learning software as important resources. New multi-media platforms provide teachers and students with a tool that includes interactivity involving the learner. With audio and video enhancements, information and learning are taking on a whole new dimension in the classroom. Paradoxically the tools are increasing in sophistication yet they are becoming more user friendly. Our primary students and teachers are learning with computer technology in School District # 9.

ii) Intermediate:

Teachers at the Intermediate level have developed new applications and functions with the technology tools provided. Teachers use technology tools to plan, to generate assessment and testing instruments, to write anecdotal report cards, to collect statistics and data on student achievement and, to research and publish. Teachers are using the technology tools to communicate with parents, other teachers and with the community at large. Teachers are beginning to consider and develop applications using telecommunications and we foresee tremendous growth in this area with initiatives underway at all levels to link and connect schools and learners to the global information system.

Intermediate students are utilizing computer technology in a variety of ways. Each day in our school district students are both acquiring and using technology skills in the following ways: keyboarding utilizing software such as Mavis Beacon, Almena word processing using Microsoft Works, Word Perfect Children’s Writing and Publishing and others.

- desktop applications using Microsoft Publisher, Print Shop Deluxe, Certificate Maker, Publish It.
- learning software in mathematics science, language arts, EduQuest, social studies.
exploration and discovery learning software which encourages and nurtures thinking and reasoning skills.
- fine arts applications include some applications like Paint and Draw programs and desktop programs.
- on-line activities (CLN, Internet, Conferencing, E-mail, etc.)

iii) Middle School:

K.M.S. has instituted a 2 month Computer Literacy course as a part of the Life Skills 7 program. This program provides instruction with keyboarding, word processing and desktop publishing to grade 7 students. Much of this course is integrated into the English and Social Studies courses. The Grade 8 students are offered an option course in keyboarding which advances from word processing to spreadsheets, databases and desktop publishing. The purchase of a new scanner has added a new dimension to student report writing. The teaching staff use computer technology with their students in their course work. The bottleneck now being experienced is that the computer room is heavily booked and access for teachers and students is not easy. This room is used for other subject classes and as a homeroom, therefore restricting further access.

iv) Secondary:

For our secondary students and teachers, technology is pervasive and imperative. Secondary students are just a few steps from the world of work or higher education, both of which demand technology experience, tools and skill sets which will determine much of their success. Secondary school teachers recognize this and they have made significant gains in integrating technology into learning and teaching programs.

Technology applications can be found in all facets of the learning programs of SHSS. Business Education, Mathematics, Physics, Computer Science, Social Studies, Fine Arts, Languages, Biology, Keyboarding, Library research, Music and Video courses and counseling. Students have access to technology to assist them in preparing for examinations and to complete class assignments. Familiarity with computer technology at the secondary level is most certainly a prerequisite for secondary studies at SHSS.

Communications/messaging systems. Broadcast journalism. The On-Line Learning Centre is using computer networks to manage the learning of over 60 students. (e.g. Pathfinders). This management system allows the students to work on a variety of different courses of study, at their own pace and in a time period that is of their choosing. The technology allows for tracking of individual student progress in reading, in pre and post tests, marking of tests, attendance and time 'On-Line'. Many of the courses 'On-line' require the students to become familiar with the computer environment in order to be successful.
Teachers use technology for planning and managing their learning programs and for tracking and assessing student progress. Grading, report writing and test generating are also widely used at the secondary level. Teachers use technology to simulate real workplace experiences (Journalism) to create a 'product'. Teachers are integrating technology with the tools provided and through identified applications.

Teachers and students are using telecommunications to access information about a variety curricular topics. The role of this technology will continue to evolve and certainly must become an integral part of district technology planning. NB Telecommunication is being utilized in a variety of ways at all levels through CLN/Internet: curriculum support; mentoring; student access for individual interest; pen pals; information searches, conferencing; e-mail.

v) Extraordinary Technology Applications

a) Specialized Applied Learning
At present, the secondary school (SHSS) utilizes some applied learning technology. Autocad equipment (computers, plotters, software) support drafting and design programs. A computerized milling machine is utilized in the machine shop/metal works programs.

b) Adaptive/Augmentative Technologies
Physically and mentally disabled students have access to limited support technologies. Some students have access to media resources (VCR and television). The district has a "switching" board used to empower physically challenged students to emancipate and control specific needs. The requirements and support of these students is based upon specific needs and is usually determined in an ad hoc way.
APPENDIX SCHOOL DISTRICT # 17
SEVEN ESSENTIAL LEARNINGS FOR TECHNOLOGY

The above three basic Principles of Learning act as the foundation for more specific approaches which would promote the effective use of technology. The following seven essential learnings for technology, if systematically applied, would require learners to develop new roles in learning, living and working:

1. The learner as information navigator.
The student recognizes and values the breadth of information sources, browses those sources, differentiates and selectively chooses sources, and retrieves appropriate information/data using all forms of media, technology and telecommunications.

2. The learner as critical thinker and analyzer using technology and telecommunications.
The student reviews data from a variety of sources, analyzing, synthesizing and evaluating data to transform it into useful information and knowledge to solve problems.

3. The learner as creator of knowledge using technology and telecommunications.
The student constructs new meaning and knowledge by combining and synthesizing different types of information through technology, telecommunications and computer modeling/simulations.

4. The learner as effective communicator through a variety of appropriate technologies/media.
The student creates, produces and presents ideas and unique representations of thoughts through a variety of media by analyzing the task before him/her, the technologies available, and appropriately selecting and using the most effective tool(s)/media for the purpose and audience.

5. The learner as a discriminating selector of appropriate technology for specific purposes.
The student discriminates among a variety of technologies and media to extend and expand his/her capabilities.

6. The learner as a technician.
The student develops sufficient technical skills to successfully install, set-up and use the environments.

7. The learner as a responsible citizen, worker, learner, community member and family member in a technological age.
The student understands the ethical, cultural, environmental and societal implications of technology and telecommunications, and develops a sense of stewardship and individual responsibility regarding his/her use of technology and telecommunications networks.
Every Child Should:

1. leave high school knowing how to use word processing and a data base,
2. be able to use an automated library system, including CD-ROM,
3. be familiar with computer operating systems,
4. leave elementary school with a comfort level using computers,
5. see computers as helping them to do better at whatever they are going to do,
6. be able to keyboard using "touch typing",
7. be able to use word processing with integrated graphics,
8. be able to complete research and reports using computers,
9. use computers to design products, e.g., DTP, CADD, etc.
10. be computer literate
11. be able to use electronic communications processes: e-mail, CLN, etc.,
12. use the concepts of word processing rather than the computer used as a typewriter,
13. be able to critically analyze data/information sources from the computer,
14. be able to problem solve using the computer,
15. be able to "train the computer" i.e. programming,
16. have the ability to evaluate sources of error, or if an error exists,
17. have a positive attitude towards computers and their utilization,
18. know how to effectively purchase hardware and software,
19. be able to evaluate programs, software, hardware, inputs and outputs,
20. understand the social impact of technology.

Every Teacher Should

1. have a comfort level with computers,
2. be comfortable and knowledgeable about computers in order to use as tools in any subject/teaching area,
3. be able to communicate with other user groups,
4. be able to utilize Computer Assisted Instruction (CAI),
5. become familiar with computer resources related to their area of teaching,
6. have a positive attitude toward the use of computers.
7. know how to effectively and efficiently purchase hardware and/or software, be able to evaluate the impact of technology.

The School and/or District Should

1. ensure access to computers for all students,
2. have and use computers for accessing information in a library setting,
3. establish a common platform for inter-school communications,
4. ensure that there is equability in the use of CLN,
5. develop an upgrading program for computer systems and networks,
6. ensure that hardware is up and running,
7. review the value of networking vs. stand alone,
8. provide inservice for teachers,
9. consider adopting the concept of "helping teacher" work to provide dedicated lines to all schools.
1. Preliminary Planning
   a. Establish an Information Technology Planning Committee
   b. Conduct Staff Awareness Activities Visit Lighthouse Schools
   c. Develop Educational Philosophy and Policies
      - Your technology goals should support your school goal
   d. Document current Computer Activities
      - What technologies are being used?
      - What hardware is available?
      - Where is hardware located? (E.g. Labs, classrooms)
      - Which curricular areas are using technology?
   e. Identify Resources
      - In-house expertise
      - Existing hardware and software
      - Access district resource staff
      - Conduct needs analysis
      - Relate to students and curriculum not hardware!
      - Identify how information technology can address needs
   f. Conduct Awareness for key groups
      - Parents

2. Curriculum Planning
   a. Review Learning Outcomes in Information Technology IRP's
      - Understand scope & sequence across grades Integrate technology into the curriculum
   b. Review Suggested Instructional Strategies
   c. Develop Additional Instructional Strategies
   d. Develop Assessment Strategies

3. Professional Growth
   a. Determine staff technology awareness
   b. Identify required knowledge and skills
   c. Find out what staff development opportunities are available
   d. Develop Personal Growth Plans

4. Materials and Equipment Acquisition
   a. Review Curriculum Learning Outcomes
   b. Determine Courseware Needs
   c. Determine Hardware Needs

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12 The following reference is by Barry MacDonald, a district principal in Vancouver District. He was a pioneer in the education information technology field. Barry was always generous with his time and knowledge. Barry passed away the first week of June 1997. He will be missed.
d. Select from District Standards

**Developing a Professional Growth Plan for Information Technology**

**Developing a Growth Plan**
1. Identify your skill objectives
2. Set Skill Priorities
3. Identify support and resources
4. Generate Learning options
5. Implement

**Obstacles to Professional Growth**
1. Changing Workplace
   ⇒ Curriculum changes
   ⇒ Technological Changes

2. Information Overload
   ⇒ Accelerating growth rate of technological information
   ⇒ Rapidly changing skill set

3. Fuzzy Targets
   ⇒ Unclear goals and moving targets

4. Lack of Planning for Growth
   ⇒ Haphazard reaming process
   ⇒ Training as an isolated event
   ⇒ Lack of integration with curriculum

1. **Identify Your Skill Objectives**
   1. Consider not only your weaknesses but also your strengths.
   2. Skill objectives should be challenging yet attainable
   3. Skill objectives should be clear and specific
   4. Anticipate future as well as present needed skills

2. **Set Skill Priorities**
   1. Focus on benefits (importance)
   2. Link each skill with a reason for learning it
   3. Stress skills that are critical to your performance and impact
   4. Integrate skills learned with work
   5. Rank your list of skills and benefits

3. **Identify Support & Resources**
   1. Self-directed Options
   2. Peer / Mentor Options
   3. Curriculum Development Options
   4. Inservice Workshops
5. Inquiry Options
6. Networking

4. Generate Learning Options
   1. Focus on skills not course titles
   2. Identify more than one option per skill
   3. Consider your learning style
   4. Identify the most time/cost effective options

5. Implement Your Plan
   ⇒ Put it in writing
   ⇒ Develop a 3 year vision
   ⇒ Stay focused
   ⇒ Keep the right skills up to speed
   ⇒ Routinely evaluate and respond to technical and workplace changes
   ⇒ Be prepared to abandon ‘old methods’

References

Burris, Daniel, TECHNOTRENDS (Harper-Collins, 1993) [sic]

Wurman, Richard Saul, INFORMATION ANXIETY (Bantam, 1989) [sic]

Forsha, Harry I., FUR (ASQC Press, 1992) [sic]

Pritchett, Price, NEW WORK HABITS FOR A RADICALLY CHANGING WORLD (Pritchett & Associates, 1995) [sic]
Application of instructional technology will require significant leadership in the district. Pre-service teacher training and in-service training for teachers does not require teachers to be exposed to technology. Accordingly, few teachers have the basic skills necessary to use technology as a tool for instruction.

Goals
8.1.1 To provide strong and adequate leadership related to technology in the school district
8.1.2 Support the use of technology in curriculum, data processing, and electronic communication for both curricular and administrative application of technology in the district

Action
8.2.1 Replacement of Coordinator
The school district has had a Coordinator of Technology for some years. The position was vacated September 30, 1995. Current plans include replacement of this position for January 1, 1996.
8.2.2 Facilitator - Computer Support Services
In the absence of a Coordinator of Technology maintenance of curriculum computer support has been carried out by the Facilitator - Computer Support Services. This position provides direct support for classroom teachers and should be retained when the Coordinator is replaced. As soon as possible this should be expanded to two positions.
8.2.3 Technicians
The current level of technical support (maintenance and repair) is far below the demand. The current number of two technicians needs to be increased to four in order to serve the existing computers and network in the system. Many of these machines are old and require significant attention. With new purchases increasing the amount of equipment in the district more technicians are required.

Coordinator Of Technology Position Description
Immediate Supervisor: Assistant Superintendent - East Zone

Core Function:
The Coordinator of Technology is responsible for the management, development, implementation, and training related to technology, data processing, and electronic communication for both curricular and administrative applications in the District.

Details of Function:
• Provides leadership in planning, managing, training, and coordinating technology in the District.
• Supervises preparation, implementation, and revision of the District's Technology Plan.
• Assumes responsibility for the implementation of the goals described in the District's Technology Plan.
• Prepares, implements, and monitors technology budgets within the District.
• Works with administrative officers, teachers, exempt staff, and support staff in addressing and servicing technology needs in the District.
• Develops specifications for hardware, software, and services required to meet the technology needs of the District.
• Plans and recommends strategies for designing and implementing Wide Area Networking (WAN) and Local Area Networking (LAN) in the District.
• Develops and implements a comprehensive plan for integrating technology into educational programs throughout the district.
• Plans, supervises, and evaluates the provision of technological in-service training for administrative officers, teachers, exempt staff and support staff in the District.
• Acts as a District technology contact for the Ministry of Education, post secondary institutions, business, and industry.
• Works with administrative officers in the District to set budgets and to develop priorities for the acquisition and replacement of technology equipment.
• Represents the Board in advising the Canadian Union of Public Employees (CUPE) and the North Vancouver Teachers' Association (NVTA) of technological change in the District.
• Establishes and maintains a program of technology research and development.
• Supervises and evaluates the Facilitator(s) - Computer Support Services.
• Supervises and evaluates the Computer Service Technicians.
• Performs other duties as required by the Assistant Superintendent - East Zone.

Facilitator - Computer Support Services
Position Description
Immediate Supervisor: Assistant Superintendent - East Zone

Core Function:
This is a Position of Special Responsibility as defined by the NVTA Collective Agreement. The Facilitator Computer Support Services provides support to the District's teachers in relation to using technology to enhance curriculum delivery.

Details of Function
• Provides software support for programs used regularly in the District's classrooms (including but not limited to Microsoft Works, graphics and accounting programs).
• Provides system support for both Macintosh and DOS/Windows platforms with an emphasis on Macintosh systems.
• Provides network support for MacJanet networks.
• Supports school personnel in the application of computer telecommunications (including Internet).
• Assumes management of the School District's First Class (CompuLink) E-Mail system.
• Assists in planning for technology in the school district. Further, provides guidance to schools in the development of individual school technology plans.
• Identifies and solves technical problems with computers, computer peripherals, and networks.
• Identifies and refers technical problems to the School District's Computer Technicians.
• Provides in-service training to teachers and other employees in the School District in areas relating to curricular and administrative use of technology.
• Prepare reports on computer related activities for the district's teachers and administrators.
• Performs other duties as required by the Assistant Superintendent - East Zone.
APPENDIX EQUITY

Appendix School District # 1 Equity

Equity will be achieved by consistent development of the following:
1. networking of the computers in each of the schools.
2. connecting all schools to the Internet.
3. purchasing computers needed to achieve Ministry guidelines.
4. staff development
5. policy re: equity of access for all students and staff. [S.D.#1]

Appendix School District # 2 Equity

- equitable distribution of education technologies within the district and a multi-year funding commitment.

Appendix School District # 4 Equity

Students should be encouraged to improve their computer skills regardless of sex, age, mental or physical capability. Barriers to equity should be proactively identified and removed.

Appendix School District # 7 Equity

We also recognize that our small schools must receive special attention with regard to the allocation of funds in view of their limited capacity to raise financial support. Equity and access are paramount. Our plan strives to bring together financial support from all sources in order to maintain equity/fairness and accessibility in the system.

Appendix School District # 9 Equity

- to provide an equitable distribution of quality hardware and software so that all students and staff have equal opportunity for access, use and training
Appendix

Appendix School District # 15 Equity

Curriculum:
- Implementation
- Training of employees
- Equity of ability to deliver the scope and sequence based upon students' opportunity to access technology and acquire grade level skill

Appendix School District # 16 Equity

Supplies, replacement equipment, learning resources, in fact all resource areas are distributed between schools according to carefully determined allocation formulas. These formulas vary according to resource and year, but are always worked out at the committee level in a manner which is fair, consistent, and equitable.

Appendix School District # 17 Equity

Achieve a fair and equitable distribution of technology amongst schools within the district while at the same time not penalizing schools for their initiatives.

Appendix School District # 21 Equity

- providing students equitable access to technology;
- distributing evenly computer equipment;

Appendix School District # 22 Equity

Equitable Distribution and Ministry Ratio
Using the principles of equity, connectivity, and currency we were able to prioritize and establish criteria to direct the allocation of funds to schools. Our goal for elementary schools is a basic standard of one networked lab of up to 33 computers with core software, and connection to SD22Net.

Equity: This principle implies fair and equal access to technology by all participants.
Appendix School District # 23  

**Equity**

Equitable distribution of education technologies within the district and a multi-year funding commitment. The “background” statement outlined above indicates that the District has already made a substantial and equitable long term commitment to the use of technology at both the elementary and secondary levels. Over the course of the past five years, the District has spent close to $4,300,000 for educational and administrative technology initiatives (this figure is for hardware services only, and does not include technical support costs.) Approximately 43% was designated to elementary issues, 38% for secondary issues, and 19% for District. During the past five years, the student to computer ratio at the elementary level has gone from 29:1 in November, 1990, to 8.44:1 in April, 1995.

Appendix School District # 35  

**Equity**

Equity: Current Situation  
The computer inventory (Appendix A) highlights some of the differences that currently exist from school to school in quantity and the quality of computers. Addressing the issue of equity may be a more difficult task for our District than most others because of the decentralized management model that we have been using for the last thirteen years. In the past, Langley School District has not held funds at the District level to support any special information technology projects nor have we mandated that all school acquire certain types of information technology...

Equitable Access  
This plan clarifies the District’s position related to its desire to have appropriate access for all our students to information technology. Addressing the issue of equity is something that is required by the Ministry and something that the District wants to accomplish. Our approach has been to identify certain minimum standards that we expect to see in each school related to information technology. The following standards are described in Appendix C.

- type and extent of networking
- quality and quantity of computers available
- extent to which the information technology is used by the students and the staff
- connectivity and access to external electronic learning resources

Equity in Langley School District will mean that we expect each of our schools to develop an annually updated plan that will ensure that their site reaches the minimum levels outlined in Strategies to Achieve Equity:

1. To achieve an appropriate level of equity the District intends to use a significant position of any available funding to assist those schools that need the most help to reach these minimum standards.
2. When any available Ministry or other funds are being used the District intends to try distribute the resources in a manner that will support the equity
initiative yet still recognize and encourage those schools that have already reached or surpassed this level....

Appendix School District # 38 Equity

Educational Equity
Providing comprehensive training at a level that could make a significant difference to every staff member is likely to be beyond the range of available funding. Yet equity concerns raise an argument against focusing efforts on the already well-positioned, even if they as leaders can have a broader impact by sharing their experiences with others. A related key issue to consider is who should have priority for technology-related training. Should resources concentrate on supervisors, teacher-leaders, support staff, or on those most in need of improvement? On math and science teachers, since technology applications are proceeding rapidly in these fields, or on humanities and other fields, since they have been somewhat neglected to date? On specialists who work with children most at-risk, or on "regular" teachers who work with all children? On elementary or secondary school teachers? On clerical staff and Classroom Assistants? These [answers to these] questions will direct our professional development plans for the year/years to come.

"... equity is concerned with the promotion of personal, social, cultural, political, and economic equality for all who participate in the education system of British Columbia. The term "gender equity" emerged out of a growing recognition in society of pervasive gender inequities. Continuing traditions of stereotypical conceptions and discriminatory practices have resulted in the systemic devaluation of attitudes, activities, and abilities attributed to and associated with girls and women. The negative consequences of stereotypical conceptions and discriminatory practices adversely affect males as well as females." Ministry of Education Publication from the Web

If equity issues are not surfaced openly then too readily will technology become another source of power differentiation within the schools. Therefore when workshops are offered at the district or school level attention will be given to who the attendees are. Representative balancing includes gender, curricular area, administration, teaching and support staff, and in some cases, students and parents. Night school, Saturday and after school courses have some drawbacks for many with family and caregiving responsibilities. In the interests of educational equity there should therefore be some responsibility on the part of the district to provide opportunities for those who otherwise would be denied access to training

Recommendation
That the District work to ensure that there is equitable and representative distribution of training and access to technology.
Equitable Access:
"In partnership with school boards and the private sector, the provincial government is taking a leadership role to ensure that all British Columbia students have equal access to computers, multimedia (CD-ROM), on-line networks and other tools for working with electronic information. (Technology in British Columbia Public Schools 1995, May)[sic]

Students in all school districts must have equal access to technology.” (Ministry News Release 1995, May 23) [sic]

“The draft plan must include...equitable distribution of education technologies within the district and a multi-year funding commitment” (Memo from Deputy Minister, 1995, May 22)

Recommended VSB Actions:
The Vancouver School Board currently has two policies regarding equity of access:

“Ministry and district hardware funds be allocated to school, annexes and designated off-site alternative programs for the purchase of new or district equipment based on enrollment.” (VSB Policy 1989 February 20)

“Special Education students be guaranteed equal access to school-based computer equipment and adaptive devices be provided by the district as required.”( VSB Policy 1989 February 20) (From the 1995 plan)

From the 1996-1997 Plan:
The Vancouver School District attempts to address growing wide diversity in its student population. It also accommodates for differences in English as a Second Language, French Programs, Special Needs, First Nations, and Anti-Racism and Multiculturalism to provide equity for access to technology and to achieve equality of outcomes.

Hardware and Software:
• to foster equity and access

Phase 6 September 1999-July, 2000
Equity allocations to schools (maintenance and replacement)
Appendix School District # 44  
Equity

1. Equitable Distribution and Equitable Access to Learning With Technology

Background

Previous technology planning groups (Killeen, 1987) have identified equality of access as an important issue in the district's educational goals. Efforts to address equity of access resulted in the recommendation and implementation of a minimum standard for elementary and secondary schools.

Recent fiscal conditions have restrained the ability of the district to adequately ensure equity. Significant differences exist in student access to hardware and software among the schools in the district. The number of computers in a school varies from 13 to 57 in elementary schools, and from 18 to 118 in secondary schools. In elementary schools computer to student ratios vary from one computer for every 6.9 students to one computer for every 23.6 students. In secondary schools computer to student ratios vary from one computer for every 6.0 students to one computer for every 19.8 students.

Goals

1.1.1 to provide access to current educational technology to every student, teacher, and related support worker
1.1.2 to establish a networking infrastructure at all sites
1.1.3 to identify and implement grade level technology goals to ensure equity of delivery to all students

Action

1.2.1 establish a set of district standards for school based connectivity, including cabling, network hardware, and Network Operating Systems
1.2.2 [sic]
1.2.3 establish a base-line standard for hardware and software at elementary and secondary schools that will meet the educational needs of the students and teachers
1.2.4 establish an Equity Fund with resources contributed by the district, parents, and corporate partners to address equity issues
1.2.5 require schools to develop school-based technology plans
1.2.6 assist schools which do not meet the base-line standards for hardware and software after the development of a school based technology plan
A number of schools have received support for technology through District funding and/or District partnership initiatives during the past two years. Having reviewed the allocation of those District, Ministry of Education, and partnership (IBM, BC TEL, etc.) moneys, DTC 1994-95 recommendations are presented in the following context:

• allowing all sites to acquire the necessary District infrastructure ensuring connectivity.
• increasing staff knowledge and skill (in service) [sic].
• supporting school site plans.
• consideration of both "fairness" and "equity".
• Recommendations for 1995-1996 address the recurring themes and issues of:
  • educational goals and objectives for technology.
  • the process of planning for technology.
  • adequate funding.
  • coordination and support of technology activities, initiatives, and hardware.
  • communication.

**Appendix School District # 47 Equity**

Equitable distribution of education technologies within the district

The plan addressed the need to provide a uniform introduction of up to date technologies across the district such that no one school would have a technological edge.

• Provide each school library/media centre with a minimum of five computers for student use.
• Provide each school library/media centre with current and future instructional technology including appropriate software for student use (CD-ROM, automated card catalog, laser video disk, etc.)
• Provide computer labs in all curriculum areas requiring them at secondary school.
• Provide every classroom with at least two computers and one printer.
• Provide students and teachers with opportunities to use computers and other instructional technology outside of school by beginning a lending system. Each school should have a computer(s), keypad(s) available to students and teachers for overnight and/or weekend use.
• Provide each teacher with a classroom computer workstation

**Appendix School District # 48 Equity**

Equitability
• to ensure equitable distribution of educational technology within the district.

[Computer Advisory Committee] CAC Position
• that all learners must have equal access to appropriate technology.
• that computer technology is an integral part of curriculum.
• that technology is playing an increasingly more important role in supporting successful learning
• that libraries be automated and be connected to a wide range of information sources.
• that the efficient implementation of the use of technology requires access by students and teachers to appropriate learning resources
• that we promote gender equity in the access to technology.

**Appendix School District #52 Equity**

To achieve a fair and equitable distribution of technology amongst schools within the district while at the same time not penalizing schools for their entrepreneurial skills.

**Appendix School District #54 Equity**

School District #54 is committed to providing its students with equitable access to information technology comparable to that enjoyed by other school districts in the province. The district is contending with aging equipment unable to meet the demands of the information age.

**Appendix School District #55 Equity**

Equity

Individual Schools will develop their own technology plans within District networking and software guidelines. To ensure equity, technology funds will be distributed to schools on a per capita basis, keeping in mind the different student/computer ratios required at the elementary and secondary levels. This will ensure equitable distribution of funding without penalizing schools for the efforts they've made in the past or for special funding projects put in place to enrich their technology environment.

**Appendix School District #56 Equity**

Equity of Access

The Canadians who lack access to information technology are those in rural, remote areas. They tend to have fewer educational resources and poorer telecommunication facilities. At the same time Internet providers concentrate on urban markets, not rural areas. Unfortunately, most networking/distance learning
initiatives have provided access to learners in urban areas. Such communities tend to have higher than average incomes. All our students are located in small rural communities in North Central BC. This district is committed to the notion that our students are, paradoxically, the most in need of access to information age tools, and the least likely to encounter these tools given their rural northern setting.

Northern interior communities face a number of challenges due to their small size and geographic dispersion. These factors make equity of opportunity and access a major issue. Special initiatives, partnerships and infrastructures are required to redress the imbalance of opportunity experienced by citizens in our region. In our view, technology can act as an equalizing agent in this situation. Nevertheless, limited opportunities, timetable restrictions, facilities and equipment bottlenecks, and trainer shortages in specific skill/knowledge areas are the greatest constraints to skill development, career exploration and educational change. The School District believes it is possible to create an environment that minimizes such constraints, encourages economic development and shifts a resources based economy towards the role of an information age competitor.

Appendix School District # 62  
Equity

Equity of Access to Technology
Technology based learning resources will be made available to all students, not just to those in certain subjects, classes, areas, grades or categories. All students in this district are included in the Committee's pursuit of the above Statement of Purpose, Vision and Mission. To this end the Committee will establish procedures to ensure that funding allocations to school support increasing equity of student access to technology appropriate to their skill levels and needs, both within each school and across the district.

Statement of Purpose:
We strive to enable all students to realize their potential, to acquire the knowledge, skills and attitudes needed to contribute to a healthy society and a sound economy, today and in the future.

Access to technology, and the lack of access can create great inequities in the results of the teaching/learning process.

Equal Access:
Students will have access to current information technology appropriate to their learning needs.

Appendix School District # 65  
Equity
Appendix

Equity

One of the larger issues for the Board to consider is the equitable distribution of technology in the district. Inequities exist. Initial distribution of equipment has gone to those schools where staff have expressed an interest and have had some expertise. Other staffs have not shared the same level of interest. Some parent groups have been very active in their support of their school acquisition of new technology. The recommendation that the Board have been considering are to establish minimum standards based on student to computer rations for schools. The Board would then act to ensure all schools meet the standard. The initial funding in the proposed plan would see some of the needs of those schools who have the least being addressed first. Schools that have had support from parent would not be penalized over the five years.

Technology Goals and Objectives

To increase administrative efficiency through the use of appropriate technology;
• Provide equitable access to the district network for all district sites;

To provide equitable access to technology;
• Provide updated technology for all computer labs, classrooms, libraries, resource rooms, learning assistance rooms, and offices for all district locations;
• Develop and promote technology standards and guidelines

Equity

The District has consistently addressed the issue of equity. The school-based LAN program started in the mid 1980’s has continued and has moved from the installation of “new” labs towards ongoing replacement/upgrading of existing labs. Older equipment has been redistributed into area where the displaced technology can still meet specific needs. It is vital that this upgrading program continue to ensure that all schools have reasonable/equitable access to current technologies. There is also a need to extend school lab networks throughout the school into classrooms and the library.

Appendix School District # 69  Equity

Mission:

All students have access to information appropriate their learning needs. The interfaces for information technologies should represent the current standards so that the educational environment is relevant to the world at large. All students and staff have equal and adequate access to an information systems infrastructure. Students learn how to process information thoughtfully through access to world wide resources by being made aware of network citizenship. Innovation in Technology is recognized and supported financially. Teachers model the effective use of technology on an on-going basis. Teachers as professionals have access to the current information technologies they need.
Appendix School District # 70  

Equity

The question of equity
In a workplace of increasing technological dependence, the differences between those who thrive in the aforementioned environment and those who do not are becoming greater. Successful ventures are very often found in small businesses and entrepreneurship which are able to adapt more quickly to changing technologies. Individuals who are able to adapt quickly to new environments will also be at an advantage.

With equitable student access to a Learning Resources Network, it will be possible to begin to provide a comprehensive integration of the information Technology K-12 Curriculum, now in development. The objectives of this curriculum will be included in the Integrated Resource Packages for each grade and course.

Equity
The issue of equity is an important issue in the development of the plan. Given the severe shortage of resources, for example, to install structured wiring, and the need to proceed with one school at a time, some schools will, at any time, be farther ahead in the wiring process than others. In the long term, all schools will have equitable access of the Learning Resource Network.

The funds that come from the Ministry of Education will only permit us to get less than one quarter of the way to meeting the target student/computer ratios of 3:1 and 6:1. With additional funds from the school district, we hope to reach student/computer ratios of 6:1 and 12:1, 50% of the target ratio. School districts that are able to generate other revenue may be able to reach the Ministry targets more quickly. Some school in this position have expressed an interest in assisting other school once they have reached the Ministry targets [sic] ratios. This interest in cooperative ventures will greatly alleviate problems of inequity.

It is the intention of the Board of Trustees to monitor progress towards the Ministry’s student/computer ratios and to address the issue of equity should serious disparities arise.

Appendix School District # 81  

Equity

Goals For Technology Plan
1. Equitability
   • to ensure equitable access to educational technology throughout the district.
The opening statement of the philosophy of School District No.92 (Nisga’a) contains the statements such as “the provision of equal opportunity for all students to develop their individual, spiritual, intellectual, mental, social, emotional, and physical potential at the maximum level, regardless of race, color, creed, or sex.”

To this end, the technology plan of the District allows for a combination of school-based and District level decision making with respect to the long range goals of the purchase and use of technological advances. The rationale for the decision-making at two levels is the result of the relatively high turnover of teaching and administrative staff over the years. This turnover has resulted in “have and have not” schools with respect to the acquisition and use of technology related equipment and services. Thus, in an attempt to create a more equitable and functional system of allocating funding for the purchase of more current equipment, the District has a centralized plan for major purchases, a school-based method of acquiring appropriate software and accessories and a combined in-service program to address both District and school level needs.