Science and Mathematics Education Centre

Invisible Cusp and Unintended Outcomes: A Response to Two Influential Documents as Heralds of Computers in Tasmanian Government Schools.

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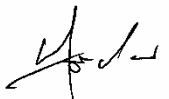
Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief, this thesis contains no material previously published by any person except where due acknowledgement has been made.

Signature: 

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Abstract

I have long felt that we, as educators, seem to be walking backwards into the future, facing where we have been. I was hopeful that the introduction of computers into Tasmanian schools in 1997 would signal a 'cusp', a point where teachers would, figuratively and willfully, turn 180 degrees, and move forwards, in an imaginative and exciting way, to help their students prepare well for an unpredictable future.

Computers as Tools for Teaching and Learning was implemented by the Tasmanian Government and was accompanied by two documents: a 'policy-cum-teachers' guide', *A Planning Resource for Schools and Teachers*; and a literature review of research that underpinned the government initiative, *Does Information Technology Improve Student Learning Outcomes?* I consider these two documents within this thesis embarking on a historical narrative journey. I demonstrate that these documents represented 'thin' conceptions for justifying and using computers in Information Age classrooms, particularly primary classrooms. On my journey I hope to develop a 'thicker' understanding of the potential unintended consequences of the Tasmanian Government's initiative to give all students access to computers. Whilst exploring the only policy-related document released since 1997 and finding in this the same kind of thinness, I now seek a rich place from which I can maintain my moral agency as an educator - optimistically, lovingly and with hope for a good future for our children.

To help understand my reaction to the documents, I turn to the words of philosopher writers, who provide some perspectives for inquiring into the socio-cultural layers of complexity with which I am concerned. I draw upon two particular conceptual frames. One is William Spady's metaphor: winds of change blowing across the tip of an 'educational iceberg' that drifts in a sea of ingrained habits, past practices and institutional inertia, and accumulates cultural and historical paradigms successively through the ages - Feudal, Agrarian, Industrial and Bureaucratic. In this Information Age, winds of change blow across the tip of the 'educational iceberg', that is, across one-tenth of it. The nine-tenths of inherited characteristics, below the surface of the sea, impede our progress, and we remain sheltered from and largely uninfluenced by

emerging conditions and realities. I ask why we continue to drag nine-tenths of the iceberg along with us, why computers restrict our focus on the past, and why computers in schools might not succeed in turning us, at the cusp of change, towards a humanly hospitable future.

My second frame satisfies my resolve to understand my agency in the winds of change. I draw upon Neil Postman's three cultures of technology: Theocracy, Technocracy, and Technopoly, the culture in which we live today. In Technopoly, all forms of cultural life are subjected to the sovereignty of technique and technology, which becomes a hegemonic state of mind and culture, and gains status as the chief source of authority, definer of life-goals and provider of satisfaction. At last, the resolution of my response to the growing phenomenon of computers in classrooms finds itself in Postman's wisdom, as one of tolerance, optimism, revolution and love.

Acknowledgements

I wish to thank my supervisors Dr Roy Pugh and Dr Bevis Yaxley for their guidance and support. Thank you to my family for their patience and for never doubting my endeavour, Dr Joanna Le Métais for her encouragement and advice, Margaret Eldridge for her proof- reading skills and to Helen Quilty for her artistic talents.

I dedicate this thesis to my mother and to the memory of my father, who passed away suddenly on April 17th 2009.

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Chapter 1

I, Too, Have a Story to Tell

> [Alisdair] McIntyre is helpful in understanding certain constraints and possibilities. He points to the historical or narrative nature of our lives that asserts itself in any narrative quest, including those in narrative inquiry. In McIntyre's view, single actions only become intelligible if they are seen as moments of possible, or actual, histories, and our lives are understood as enacted narratives. As such, we are burdened with a past for which we are accountable - even though it is not all of our own making - and with a future that is both unpredictable as well as foreshadowed by preconceived images of it.
>
> *Carola Conle*

This inquiry emerges from my narrative writing, or telling, from a place of discomfort and questioning about what I was seeing and doing with computers in my classroom when the force of new technologies was unsettling the security of classroom practices in the late 1990s in Tasmania. Through narrative writing, and through reading and thinking with philosopher writers, I have found a voice to enable me to offer an account of my practice and to conceptualise the nature of my practice, even if tentatively at first.

By narrative I mean, in Neil Postman's words, "a story of human history that gives meaning to the past, explains the present, and provides guidance for the future" (1993, p.172). My lived and my academic routes became 'one road' because my past shaped my inquiry. I was living amidst the tensions of the new 'invasion' of computer technology into my classroom. Subconscious questions were pushing for answers that I did not have. Yet I could see a future that was promising some kind of opportunity to resolve those insistent questions. In this sense, my narrative is a historical one.

Within this historical narrative I consider two documents that were major features of the Tasmanian Government's policy for implementing information technology in schools. The first of the two documents, *Computers as Tools for Teaching and Learning: A Planning Resource for Schools and Teachers* was published in September 1997. And the document *Does Information Technology Improve Student*

Learning Outcomes? was published in October 1997. They were prepared, published and released, one month apart, by the Department of Education Community and Cultural Development (DECCD), this name reflecting the Government's design for this department at the time. My inquiry here is a response to the impact that fellow teachers and I experienced from the subsequent implementation of the policy. As the policy implementation progressed, it was largely supported by the two documents.

In this thesis, I follow the journey of my inquiry: from my initial enthusiasm and excitement, to a growing discomfort with the lack of educational intention and purpose that the documents revealed, until I find a place within myself where I can be comfortable with my educational understandings. In the telling of this journey I believe I can contribute to the understanding of readers who might share the mixed enthusiasm, discomfiture and resolution that I experienced. I hope that the understandings that I reveal in this thesis add to any continuing debate about the unintended social and cultural consequences of technology for a good future for our children.

In 1997, the then Liberal State Government in Tasmania announced, from its Directions Policy Statement for Education, that all Government school students would have access to computers in classrooms at a ratio of one computer to five students and that all full- time teachers would each have their own laptop computer. The policy states:

> Students must be prepared to live and work in the information age. They need the skills and capabilities to work with modern information resources and technology. In the twenty-first century the raw materials of the economy will be knowledge, skills and information. The basic tools will be computers, electronic networks and other information technologies. Schools must have these tools to deliver the improved learning outcomes required.
>
> The government will provide the resources that schools and teachers need to become leaders in teaching and learning using information technology. Effective use of information technology in the classroom leads to improved learning and outcomes. There is

> very good evidence that student learning improves if information technology is used as an effective teaching and learning tool. (Directions for Education, 1997, Implementation Team, Educational Planning Branch, p.11)

Soon after, the Government education department officers distributed two documents to schools state-wide. The document, *Does Information Technology Improve Student Learning Outcomes?* constitutes a review of literature relating to the claims and counterclaims emerging at that time. It was made for the use of technology in schools and discusses potential effects on different aspects of teaching and learning. In the Executive Summary (p.*v*), the very first statement looks like this:

• **It is possible to draw a balanced picture of the use of information technologies in relation to teaching and learning**	There are many claims and counterclaims about the use of information technology in schools. In the early years there was a great deal of unsubstantiated rhetoric, with many exaggerated claims. There is now sufficient research to provide a more balanced discussion on the value of computers in education. It is therefore possible to draw a more realistic picture of what computers can and can't do.

Figure 1. Directions for Education, 1997

The layout of the document is in itself perplexing, it looks like a report set out with the format of the above table, in dot points throughout, but it never claims to be a report. Nor does it claim to be a policy statement, although it was published under the umbrella of the policy, Directions for Education (DECCD, 1997b, p.1). Yet it was the only document presented to teachers to justify the use of computers in classrooms. It does not *claim* to be a review of literature either. A quick scan through the document and one can see that the document cites research plentifully in each of its section titles, some of which are:

3. An overview of claims and counterclaims that are made about the use of technology in schools.

4. Consideration of the quantity, quality and variability of the research evidence on the use of information technology in schools.
5. Research on the effect of information technology on the achievement of student outcomes.

7. The effect of information technologies on affective and socio-psychological student outcomes.

9. The effect of learning technology on teaching practice.

Thus, one cannot be blamed for assuming that it does constitute a literature review. This is why, as my inquiry proceeds, I refer to this document as a review of literature. I use the acronym DECCD for the Department of Education Community and Cultural Development for the source of both documents of my inquiry. This document, the literature review, *Does Information Technology Improve Student Learning Outcomes?* is cited as DECCD 1997b. 'b' because it was the second document published.

I introduce this document first even though it appeared in teachers' mailboxes some four weeks after the arrival of the first document. My inquiry requires me to devote more time in responding to *Does Information Technology Improve Student learning Outcomes?* because it is the one place where a rationale is expressed for introducing computers into classrooms.

When I refer to the second document, *Computers as Tools for Teaching and Learning: A Planning Resource for Schools and Teachers*, I shorten its title to *Computers for Teaching and Learning* and cite the source as DECCD, 1997a. *Computers for Teaching and Learning* was to be a "resource...designed to assist teachers in schools when they are planning how best to use computers as tools for teaching and learning" with the reassurance that "the ideas in it can be applied in all areas of learning from kindergarten to year twelve" (DECCD, 1997a, p.2). It claims that computers expand the "repertoire of methods by which students can learn and teachers can teach" (DECCD, 1997a, p. 2). This 'how to' document does not exactly describe the experience of River Oaks School in Canada but uses it to assure readers and users that, as at River Oaks, "computing tools" are "nothing special", they are "just there and transparent", but their effect has been "huge" (DECCD, 1997a, p. 2). Under the heading "What's the Crucial Issue in Education?" teachers were told,

> ...student learning is the primary purpose for educational computing in classrooms. Computer-based technologies are of

> little value in themselves and therefore should not be allowed to gain a life of their own detached from student learning. (DECCD, 1997a, p.4)

It seems obvious that the two documents were to complement and support each other. As it happened, in 1998, the incoming Labour State Government announced a review of computers in classrooms before committing itself to the Directions for Education Policy initiative of the outgoing Liberals. Schools had undertaken a considerable amount of school-wide planning and teacher professional development in preparation for the introduction of computers into classrooms. Eventually, the original policy was implemented without significant changes.

In the years ensuing from 1997, within departments of education, whose nomenclatures changed with succeeding governments and policy directions, researchers and academics produced various studies in response to innovations related to computers in classrooms that were taking place state-wide. It is essential to note that, during this inquiry, it was not possible to access these studies, as they were never made publicly available. Only a limited number of people, the writers and participants in some of the evaluated programs, still know of their content. When I questioned colleague researchers and branch directors, they told me about some unpublished papers they had written with titles that suggested attempts were being made to develop some educational and philosophical understandings through the evaluation of projects which initiated computers as tools in classrooms. For example, I heard some promising titles, such as *Educational Engagement at the Intersection of Technical and Pedagogical Interactivity, New Ways for a New Age: Studying E-learning Environments* and *Bringing Possibility into the Living World of Learning: Creating New Knowledge and Practice through Innovative Online Learning in Tasmanian Schools.*

As far as I can ascertain, until 2008, no other official documents were publicly released by the successive education departments with similar substance or emphasis on their importance through fanfare and state-wide distribution - though a developing system-wide intr*a*net dispatched various suggestions and helpful hints along the way as to how computers might be used in the classroom across

curriculum areas. In 2008, the Department of Education posted to all schools the Tasmanian Curriculum Information and Communication Technologies Communiqué. In chapter 6 of my thesis, I show that this Communiqué was only to reflect the same thinking, sentiments and promises of the first two documents.

I believe that the introduction of computers into Tasmanian classrooms has affected the aims of education, the assumptions about student learning, and the teaching and learning experience of the students and teachers in Tasmanian primary schools. I believe that computers are not an independent variable in the classroom. It is not the intention of my thesis to prove or disprove any 'effects' of the policy.

It is my intention to consider whether I might find any justifiable educational purposes reflected in them. What educational purposes can I come to understand first, and then to consider where I might find them reflected in the DECCD ICT policies? What purposes can I come to understand which, may have influenced the DECCD's understanding of educational purpose leading up to and during the 1990s, the time when ICT policies were being developed, and in the context of the times, when computers were being introduced into Tasmanian schools. I hope that this inquiry will illuminate some key issues that serve to deepen the understanding of the wider social and cultural impacts of technology in Tasmanian classrooms.

My questions require me to focus upon the two documents released by the DECCD in 1997, the literature review and *Computers as Tools for Teaching and Learning*. I wish to reflect upon the thinking behind, under, over, for and against the implementation of the Directions for Education Policy as it was mainly articulated and justified in the two documents. I draw upon Neil Postman's work in his book, *Technopoly, the Surrender of Culture to Technology* (1993), to find a conceptual framework to begin to develop my response to what I saw unfold within my primary school classroom, and to what made me so uncomfortable with the two documents, the content of which dominated professional conversations and professional development programs for a number of years. Postman's "technological cultures" describe the different degrees to which societies adapt to the discovery and invention of tools. Contrary to the notion that tools are "nothing special" or "just there and transparent", Postman says that tools are not "neutral": they incrementally, but

fundamentally, affect the ways in which societies and individuals come to see themselves.

On my journey of exploration, as I recount my own story, and consult and tell of a number of readings, I wish to better understand some social and cultural implications and some unintended consequences of an unquestioning acceptance of computers as a panacea for teaching and learning. I emphasise that my intention is not to survey how computers as tools have been used, or to measure learning outcomes, but to be cautious of the danger of not having a critical perspective or educational philosophy when governments and their jurisdictions initiate new technologies in schools. It is essential for my understanding to deliberate upon the lack of deep educational and philosophical inquiry evident in the documents that were accompanying the DECCD computer roll-out into schools in 1997.

Did the DECCD consider it necessary to introduce computers into our classrooms as once it was thought necessary to bring in radio, film and television – to keep abreast of and expose students to new, progressive technologies? To the question, "Why should we do this?", the literature review, *Computers as Tools for Teaching and Learning* answers, to make learning more "efficient and interesting". In Postman's *Technopoly*, "efficiency and interest" is a technical answer about means not ends and needs no justification. I believe, if we, as educators, do not address the question, "What is education for?" we do not have an educational philosophy.

Did the DECCD carefully evaluate, along with any potential, positive outcomes, characteristics, factors and contexts that would contribute to the success or failure of computers, the possibility that some outcomes might be undesirable though unintended? When it introduced computers into Tasmanian schools to create new understandings about teaching and learning, new systems to manage policy implementation, professional development for teachers, resources, and accountability, in what ways could the DECCD have produced unintended outcomes and unforeseen losses? Is it possible that there might have been more investment in technology as an end, rather than as a means of education? In what ways might government decision-makers have recognised that it is the way in which technologies are used that make the difference between simply accessing information

and acquiring knowledge? Ought we be concerned that the Tasmanian Government might have been making a leap of faith, assuming that access to information is synonymous with becoming knowledgeable? These are the questions that trouble the beginning of my inquiry.

But I write with impunity, that is, with the intention of being free from giving or taking negative backlash. I do not wish to, nor do I consider myself qualified or expert enough to judge educator colleagues, government researchers and politicians. My intention is to bring some insights into understanding the thinking expressed in the two documents through questioning, considered dialogue with colleagues, and drawing upon the writings and thinking of philosopher writers, scholars and other researchers about the consequences of placing computers in our classrooms.

I wish to show that the two initial government-sponsored texts show only thin conceptualisations of what to do and how good it would be to have computers in classrooms. In the article, *The Art of Interpretation, Evaluation, and Presentation,* Norman Denzin shows that "thin descriptions simply report facts, independent of intentions or circumstances." In contrast, he shows that a "thick description …gives the context of an experience, states the intentions and meanings that organised the experience, and reveals the experience as a process. Out of this process arises a text's claim for truth, or its verisimilitude" (2001 p.324).

In my response to the two documents that heralded the introduction of computers into Tasmanian classrooms, I wish to 'thicken' those first conceptualisations not only through narrating the process of my lived experience as an agent of educational change in the years that followed. But also through considering the work of Jerome Bruner, Thomas Alexander, Paulo Freire and Max Van Manen who expose the question 'what is education for', and who might offer me other ways of understanding the paucity, emptiness of the DECCD's concept of computers as neutral tools that can be used to gain skills for the adult workplace.

I have embarked on such an inquiry as a teacher. Teacher as researcher, like Carola Conle, "I was an actor on a stage I did not design and I was part of actions that were not part of my own making" (2000, p.193). In some ways, I could go so far as to say

I was a pawn, one piece of a game strategy to be moved according to the decisions and judgement of players more powerful than I. I have investigated the views of other teachers and summarised them in a working paper for this thesis: *Working Paper 1, Teacher Interviews: Reflection on a Computer Roll-Out*. I have found and borrowed frames for my thinking in the literature I have consulted.

In Conle's article, *Thesis as Narrative* or *What Is the Inquiry in Narrative Inquiry?*, I find some features in her approach to inquiry that I use in mine. I, too, attempt to highlight the "intellectual as well as the emotional qualities inherent in narrative inquiry" (2000, p.189). I also have a "story to tell, views to unfold [and] images to impart" (p.189). My perspective, understandings and the nature of my personal agency as a teacher become clearer to me as a journeyman: classroom teacher, thinker, researcher and writer.

I find I can only explain the complexity of the philosophical, theoretical and human travels of one journeyman by using my body in a vignette: I suddenly stand up in the middle of a deep conversation with a colleague about the questions I ask here and I wave my hands, walk backwards towards an imagined future, point forwards, then turn and walk towards the backwards direction I was walking in the first place, towards the future. My metaphoric turn is the 'cusp' to which I was looking forward to so much when the roll-out of computers began in Tasmanian schools in 1997. The cusp is the point where we turn, look forwards not only motioning towards but as agents moving into possibilities of a future, not always looking back passively to the past but honouring that we are what the past has made us.

To convey my short, dramatic vignette I enlisted the help of an artist friend to see whether it would be possible to display a dimension of my notion of a cusp in a drawing. My friend watched and listened to me very carefully and was able to symbolise the metaphor of my cusp, somewhat satisfactorily in Figure 2 below.

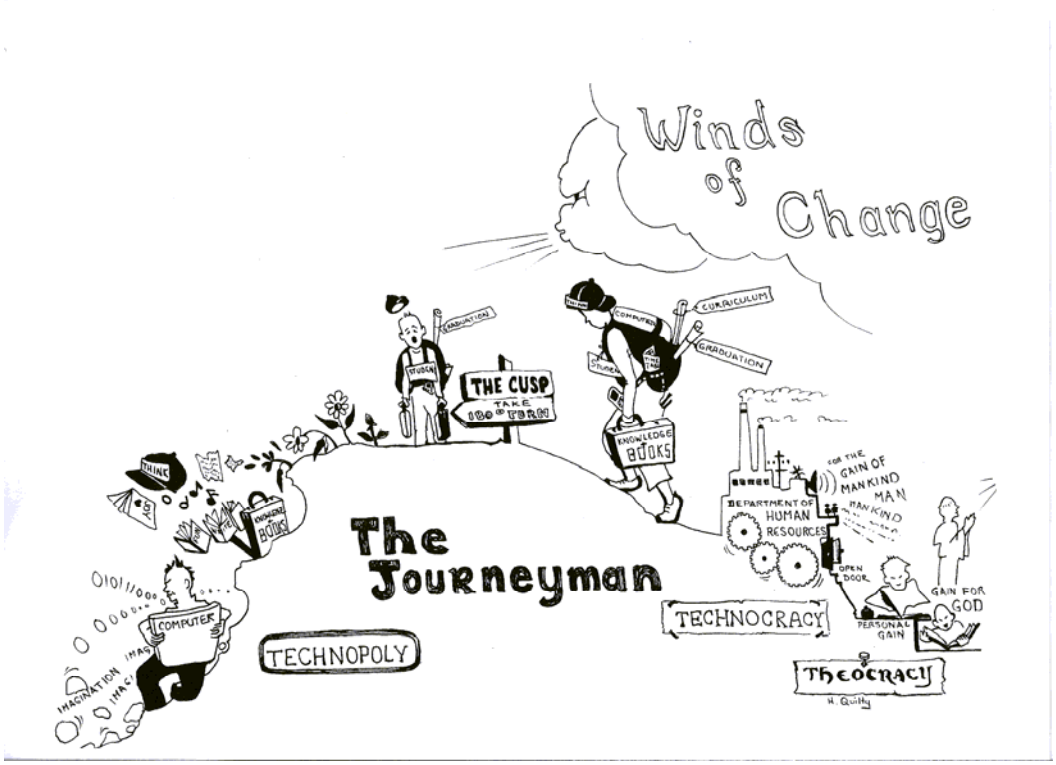

Figure 2. Helen Quilty 2009

In the drawing, the journeyman is moving forwards encumbered by his past. My hope was that when he reached the cusp, the 180 degrees turning point towards the brave new world of information technology, he would be caught by winds of change and be blown into an exciting high-tech world. Instead, as I show through my inquiry, I have come to fear that all he can do, inexorably, is turn to Postman's *Technopoly*, after climbing past the signposts of *Theocracy* and *Technocracy*. Labouring at the top of the hill, the journeyman might be astonished to realise that he has not very much to look forward to after all.

This is how I try to seek understandings about my deeply felt concerns raised again, what is education for? Over time I have come to the view that, through my own knowledge, experience and understandings as a classroom teacher, and through the journey of developing this narrative inquiry and response to the DECCD's two documents, that the computer might not be a cusp in the way that I had hoped.
In addition to Postman, there are a number of other philosopher writers who provide me with some perspectives for inquiring into and understanding the socio-cultural layers of complexity and which I believe are not adequately acknowledged or

exposed by the DECCD in the documents accompanying the Government's information technology policy implementation in Tasmanian schools in 1997. I will return to these philosopher writers in more detail in later chapters, but wish to introduce them briefly now, with the purpose of illustrating the types of issues that these chapters will explore further highlighting the emphasis more on the educational, cultural, moral and ethical impacts.

Langdon Winner, author of *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (1986), asks about the political, social, and philosophical implications of technology. He demonstrates that choices about the kinds of technical systems we build and use are actually choices about who we want to be and what kind of world we want to create. Winner talks about the danger of "technological somnambulism", a condition in which progress is driven by technology itself, rather than by the vision and innovation of society at large which might be inspired by a kind of moral education where the locus is in a transforming community.

In *Philosophy of Technology: An Introduction*, Don Ihde (1993) asserts that technology can no longer be taken for granted. Its impact on and implications for the social, ethical, political and cultural dimensions of our world must be considered and addressed. Ihde offers the concept of three "deep and broad technologies" - Time, Space and Language - to illustrate early technological revolutions that have transformed entire cultures.

Landon Beyer and Michael Apple in *The Curriculum: Problems, Politics and Possibilities* (1998) examine the explicit ideas conveyed through a curriculum as well as the social, political, aesthetic, and moral perspectives and values with which curriculum is connected.

Twenty-three years ago Joseph Weizenbaum, writing *The Computer Power and Human Reason: From Judgement to Calculation* (1976), was already expressing concerns about what computers can and cannot do, and what they should not be used to do. He was especially concerned about the impact of technology on society, ourselves and our future world as we use computers as substitutes for human

activities.

Alison Armstrong and Charles Casement, in *The Child and the Machine: How Computers Put Our Children's Education at Risk* (2000), consider the real costs and benefits of introducing computers into schools. They ask whether computers really help students learn to read, write and think and what we lose when funding is diverted from art, music and physical education programs to help pay for computers in classrooms.

In her work entitled *Context and Consciousness: Activity Theory and Human-Computer Interaction* (1996), Bonnie Nardi suggests computers are mediators of human thought behaviour; humans are not reduced to "nodes" or "agents" in a system; and "information processing" is not seen as something to be modelled in the same way for people and machines.

Theodore Roszak reminds us, in *The Cult of Information: A Neo-Luddite Treatise on High Tech Artificial Intelligence and the True Art of Thinking* (1994), that an "information glut" does not necessarily lead to sound thinking. He warns of the possible dangers that computers bring a modern society including the invasion of privacy and the control over political and military decisions as part of the interplay of tension between technology and the aspirations and values of being human.

Allan November writes, in *Empowering Students with Technology* (2001), of the potential dangers of the Internet but acknowledges that it can provide ready access to a wide range of information. It requires two main steps, "accessing the internet efficiently" and "interpreting the information critically", making an important distinction between what he describes as "automating *V* informating" (p.6)

William Spady's metaphor of the educational iceberg helps me to explain the cusp metaphor I mentioned above, where I include the figure of winds of change in the drawing (Figure 2). Spady's *Paradigm Lost: Reclaiming America's Educational Future*, was published in 1997, in the same year as the DECCD literature review. He draws and speaks of an educational iceberg, "drifting in a sea of ingrained habits, past practices and institutional inertia [because] formal education accumulates

cultural and historical paradigms" (p.9). He traces stages in western cultural educational history when certain practices became ingrained. He places the Feudal Age at the bottom of the iceberg. It was an age that constituted an agenda "of sorting and selecting the most able and deserving students so that high educational opportunities are not 'wasted' on others." Next from the bottom is the Agrarian Age calendar, "which limits teaching and learning around the traditional holidays to harvest crops." The Industrial Age is next, which represents a "delivery system" that defined and organised curriculum, teaching, assessment, and student placement around the "major features of the factory assembly-line, with everyone doing pre-assigned work at a pre-scheduled workstation for the proper amount of time" (Spady, 1997, p.9). The next layer of the iceberg is the Bureaucratic Age, which defines and operates everything in the system on the basis of inputs rather than outcomes. These inputs include time spent, resources, programs, means, procedures, and roles. And the outcomes may be results, standards, achievements, ends, and goals accomplished.

Always, I understand, that, before us, is the question 'what is education for', the essentially worthwhile beginning to dialogue about intentional and innovative programs in education.

In 1995 I was writing a series of articles in *Research Information for Teachers*, published by the New Zealand Council for Educational Research, a sister of the Australian Council for Educational Research. One article in particular emerged from my early interest and desire to use computers in my classroom long before the publication of the DECCD (1997a&b) documents. *Computer Immersion in a Grade 5/6 Classroom: Key Questions and Management Issues* reported on the computer immersion trial I initiated in 1994 with eighteen second-hand computers for a class of twenty-six upper primary school students. When I return to this article in later chapters, in various contexts, the previous lived experience of research that it captures provides a background for reflecting on the continuing lived experience of using computers in classrooms through 1997 and onwards.

My journey as a teacher in Tasmanian primary classrooms continues through five more chapters. Chapter 2 narrates my experience as an individual and as a classroom

teacher within an educational community, before and during the introduction of computers into classrooms. This chapter provides the setting for my selection and interpretation of the issues explored in this thesis. I include and reflect upon the computer immersion program I introduced above.

Chapter 3 offers a history of technological developments, introduces Postman's technological cultures, and considers some implications of technological developments from the perspective of Winner (1986), Ihde (1993), Weizenbaum (1976), Beyer and Apple (1998), and others.

Chapter 4 takes up my cusp metaphor extensively and discusses notions of looking back and looking forwards while lamenting the possible demise of the promise of information technology for a new age. It is in this chapter that I argue against perceived ideas that as tools, computers are neutral in their effect when people use them. I question the unquestioning acceptance of computers when they become second nature to humans who rely on them. I show my disappointment that the emphasis on the powers of computers to think like humans prevents children from developing other ways of knowing, being, thinking and understanding, independently of machines. Chapter 5 enables me to illuminate my concerns that certain educational perspectives can be shown to be missing from the DECCD documents.

Chapter 5 concentrates on the two DECCD documents: the literature review and *Computers as Tools for Teaching and Learning*. To avoid being accused of selecting particular passages to support a particular argument, I have attempted to suspend prejudice, to be fair and to be even-handed. I have tried to comprehensively illustrate the information and thinking that the documents portray in order to assist the implementation process of policy. Of course, it is necessary to give sufficient insight into the language, register and style of the documents so that I might then make trustworthy comments as my understandings deepen.

In Chapter 6, I conclude that we are living amidst experiences of a frightful and frightening assault on human beings perhaps worse than the prediction that Postman makes as he describes *Technolpoly*. I question and ask whether technology should

ever be accepted as part of the natural order of things. I understand that every technology, from an IQ test to a car, a television set to a computer, is a product of a particular economic and political context. This chapter moves from the historical context of the two 1997 documents into the present time when we have two newer documents both published in 2008, a communiqué from the Tasmanian Department of Education on information and computer technologies and a Microsoft-backed report entitled *Being Human: Human Computer Interaction in the Year 2020*. This chapter turns to discuss the inexorable progress of Technopoly.

We shall always inhabit Technopoly, as Technopoly shall always inhabit us. The issues I raise and question in this thesis will continue to have currency for years yet to come. Feeling the weight of this inevitable condition for the globe, I seek some resolution to the misery I *could* feel if I let myself roll down the mountainside of my drawing. I follow Postman in the end, and prepare myself to become a loving resistance fighter. I consider some of the darkest unintended consequences of new technologies: In the dark ages of the new technology will our legacy be just a binary code, 01? What will be lost? Then I consider what a person can do whilst living in Technopoly. Is it best to find ways to act against the worst effects by honouring the narratives of humanity, and to defend against the possible hegemony of technology in our social and cultural worlds?

My role, therefore, as a loving resistance fighter and as I resolve to explain, is to illustrate the possibility of bringing documents, such as the two I focus upon, into a thesis for scrutiny and questioning, and for contributing to the bodies of thought and awareness that educators might worthily draw upon when they make responsible and ethical decisions every day on behalf of the children they teach.

Chapter 2

Creating Opportunities

Between 1980 and 2006 I taught in several Tasmanian primary schools, participated in state-wide curriculum development working parties, and did my best to keep up with educational thinking and research throughout this period. My emerging teaching philosophy and my experience with computers in the classroom have given rise to the questions I examine in this thesis, questions which brought me to confront and examine my teaching practices and the educational philosophies that were guiding me.

Recently I found a reflection of myself in the words of Parker J. Palmer,

> I am a teacher at heart, and there are moments in the classroom when I can hardly hold the joy…there are other moments when the classroom is so lifeless or painful or confused…and I am so powerless to do anything about it that my claim to be a teacher seems a transparent sham. (1998, p. 1)

Joy, pain, confusion and powerlessness are emotions I know well and confronted often as I taught. I discovered quite early in my teaching experience that the aim of teaching is not simply to transfer knowledge from me to my students. I came to know that, as Paulo Freire puts it,

> ...to teach is to create possibilities for the construction and production of knowledge rather than to be engaged simply in a game of transferring knowledge [and that] when I enter a classroom I should be someone who is open to new ideas, open to questions, and open to the curiosities of the students as well as their inhibitions. (2001, p. 49)

I encouraged my students to work together and to discuss their work during classroom activities. I considered it very important to empower students to explore

their ideas, to take risks and to have some ownership of their own learning. To develop a sense of responsibility for their learning I gave them some freedom to select and determine their activities, within guidelines, in addition to the activities that I, as their teacher, prepared for them. These were my ways of knowing and being in the classroom with my students.

For me, I believed that building positive relationships with my students was very important to their social and academic development. Positive relationships are the primary context for the social and emotional growth of the individual, as it is within these relationships that students develop co-operation, mutual respect and interpersonal sensitivity, whilst they experience companionship, intimacy and affection. I built positive relationships with my students in a number of ways, with humour, active listening, encouraging my students' ideas, and always trying to be fair and honest in my dealings with them. We became friends, in purpose, teacher and student, student and student. And I enjoyed the day-to-day contact, company and professional stimulation of my colleagues as we engaged in our common goal of nurturing and educating our students.

I approached my first classroom experience with computers with eagerness and anticipation. In 1984, I welcomed one of the first BBC microcomputers into my classroom. As this computer did not have a hard drive, it was very limited in its functions, for example its word processing package was so simple that being creative was impossible. We teachers took courses in BASIC™ computer programming with the view to introducing it to our students. These courses encouraged us to use LOGO™ with on screen and with a floor turtle to help students improve their problem-solving skills. LOGO™ disappeared with the roll-out of computers post-1997.

Ten years later, in 1994, I initiated a 'Computer Immersion' trial in my composite 5/6 class in a Tasmanian district high school. I had the opportunity to increase the number of computers from one to eighteen, shared between twenty-six students. Eighteen second-hand laptop and desktop computers were obtained from local businesses to provide one computer per two students. By this time, information technology was already part of the secondary curriculum, as the school had a fully

equipped computer laboratory as well as CD ROM facilities in the library. The grade 5/6 students had restricted access to the computer lab, which included the more advanced Windows™ software packages.

The objective of my 'Computer Immersion' trial was to build on the perceived natural interest and enthusiasm of my students by giving each student the opportunity to develop or improve their computing skills. I wanted to integrate the use of the computer as a tool in the day-to-day curriculum, and to foster independent learning skills. I hoped to do this by encouraging my students to share in and assist each other's learning by working co-operatively to achieve desired outcomes. I also thought it important to give access to a programming language.

In my 5/6 'Computer Immersion' trial class in 1994 I based my teaching program on the software LOGO/Writer™, which was made up of two elements. The first element comprised sequenced work booklets to guide students through programming activities. The second element was a word processing facility, which I used to encourage students to compose in various genres such as narrative, direction, instruction, poetry, recipes, reports, and so on.

I designed my 'Computer Immersion' trial to allow students, in pairs, to spend significantly more time on the computer (up to twenty percent of classroom time) with the remaining 'off computer' time spent on related activities across the curriculum, such as art, drama, maths and science. I developed my curriculum to allow for the individual abilities and strengths of my students, so that, within the same topic, their different needs were met and their achievements were recognised. To give my students the opportunity to organise their day within a set framework of activities, I negotiated work contracts with them on a daily, weekly, monthly and term basis, to allow for individual or group flexibility in their use of class time. I found it impossible to keep up with each piece of work produced by my students and introduced a practice of self-monitoring through a system of checklists. I expected my students to provide a regular sample of their written work in each of the genres by choosing 'their best effort' in each genre, which included both printed and handwritten contributions, for publication and display.

I had a basic understanding of computers and the programs that I was planning to use, which enabled me to provide initial instruction and to deal with technical problems. Above all, it allowed me to understand the ways in which the computer could contribute to all areas of the curriculum, and it helped me to encourage my students to draw on the full educational potential of computer technology.

In the previous year, eight of my boys, no girls, had used the computer software and hardware on a smaller scale. The girls complained that access to computers had been allocated disproportionately to the same group of students, mainly boys. Access, it seemed to them, was a reward for either rapid completion of their class work, or as a means of keeping troublesome students, again mainly boys, busy. When I discussed the computer immersion program with my students, the girls were definite in their opposition to the idea because they felt intimidated by the 'superior knowledge' of the boys, and were embarrassed to use computers because the boys would 'interfere' by showing them what to do.

This prior experience at school and, in some cases at home, meant that the expertise of some boys exceeded mine. I encouraged these students to develop their interest and ability and, within the co-operative ethos of my class, they were very quickly able to use their expertise to help other students. I found that giving them the opportunity to teach others reinforced both the knowledge and the confidence of the 'expert' boys. One of them displayed weak academic skills but the recognition of his computer expertise considerably boosted his self-esteem. Most of the boys were soon competent and capable of using the hardware and software available.

This peer-teaching approach worked less well for the girls. Despite my support, and the fact that there were enough computers in the new class for girls not to have to share with the boys, they were still reluctant to start using their computers. As time went on and they realised that they could work at their own pace, away from the interest of the boys, they began to take risks and to experiment. This more enthusiastic stage did not last, however, and most of the girls did not use their computers unless I prompted them. Accordingly, they achieved a lower standard of competence and confidence.

An interesting situation arose with respect to written work, which may have influenced the different levels of boys' and girls' enthusiasm. The attitude of reluctant writers, mainly boys, was considerably enhanced by the opportunity to redraft their text on screen, which enabled them to focus on content rather than presentation. Because the presentation of the printed text was of a higher standard than their handwritten attempts, they avoided unfavourable comparisons with neater writers, mainly girls. Girls now lost some of the kudos they had previously derived from their generally neater, handwritten presentation because computer printouts eliminated this advantage and, in contrast, boys gained the advantage due to their greater computer knowledge and skills. I taught handwriting lessons each day but, because the students mostly carried out authoring activities on their computer screens, their handwriting exercises lacked the context necessary to improve, or even maintain the quality of handwriting, except for the girls who generally preferred to hand write their work.

Classroom computers were not equipped with spell checkers and so I encouraged redrafting of content and spelling by conferencing. Although most students preferred using a hard copy, more limited access to printers meant that sometimes they could only view the latest version of their work on their computer screen.

Further inadequacies of the hardware and software soon became evident, especially to the small number of students who had access to Windows™ at home. Those whose word processing skills exceeded the sophistication of the LOGO/writer™ package wanted to use the Windows™ facilities available in the computer lab. The LOGO™ programming function maintained its challenge, particularly for the boys who were able to make creative adaptations to it. Not all of the computers had a hard drive, and despite the considerable time I spent supporting and 'trouble-shooting', work was sometimes lost because the discs 'crashed', causing damage or loss, and frustration for both the students and me.

At the end of this trial, I reported the following conclusion:

> Unlimited access to up-to-date computers and the associated links to the wider world considerably enhance the students' learning

> experience and preparation for adult life. However, unless careful preparation is undertaken at all levels, the benefits of what constitutes a considerable investment may not be fully realised.
>
> The 'computer immersion' experiment was limited partly due to the age / inadequacy of the computers, but at least the students did have regular access. If more sophisticated, therefore interesting, equipment was available then more of the girls may have been engaged.
>
> On a future occasion, care will need to be taken to ensure that 'expert' girls are also on hand as peer teachers, both to counteract sexist modelling and to support the learning of the less experienced girls in a similar way to the boys.
>
> The fact that the use by the girls seemed to dwindle may mean that they did not see the computer as a useful tool to their learning. It may also indicate that they feel that their general work patterns and presentation skills do not benefit from the use of the limited application of the computers that were used in the immersion programme.
>
> According to Hoyles (1988), the use of the computer in education seems to be following the traditional lines of gender bias in society, defining computers pre-eminently as male machines.
>
> While girls and boys might show a similar appreciation of the significance computers might have for their personal futures, boys tend to be more positively disposed than girls towards computers. They are more likely than girls to take optional computer courses in school, to report more frequent home use of computers, and tend to dominate the limited resources that are available in schools. (Jordan 1997, p.4)

With the benefit of hindsight, and in the context of my subsequent experience, I wish to note two important points. First, the trial was conducted at my suggestion and therefore I felt in control. I was able to ensure that the use of computers remained at all times secondary to the objectives of student learning, and that the trial took place in an ethos of mutual respect and co-operation. Secondly, virtually all the frustrations

arose from the inadequacies of the equipment and my relative lack of technological expertise on the one hand, and from the differences in the limited software available in the classroom (LOGO/writer) and the more sophisticated applications available in the school computer lab or, by some students at home, on the other. As a result of these experiences, I would say that I was relatively knowledgeable, experienced and positively predisposed to the use of computers in the classroom. I accepted the call to support the implementation of the DECCD computer roll-out into the school.

In 1999, five years on, I received four computers for our class of twenty-eight grade 5 students. Each computer featured the Windows™ operating system and the Microsoft Office™ suite MS Word™ and MS Outlook™ for e-mailing, as well as a number of CD ROM-based programs, including literacy and numeracy programs, World Book Encyclopaedia and Language Market to support the school's teaching of Italian. The Internet was available, but was in its infancy. A school Intranet had a limited number of Internet sites attached and also enabled students to share their work with their classmates.

Our expectations were raised. The students were excited by all the activity surrounding the installation of computers. Technicians were busy running wires, installing power points and suppliers delivered custom-made computer tables, each to accommodate two students. School and classroom policy and protocol documents were written and parents, teachers and students engaged in informal conversations around the school about the pending arrival of computers into classrooms.

The documents *Computers as Tools for Teaching and Learning: A Planning Resource for Schools and Teachers* (DECCD 1997a) and *Does Information Technology Improve Student Learning Outcomes?* (1997b) came to us one after the other. They gave the message that teachers were expected to change our practice to incorporate the use of computers effectively and enthusiastically into our classroom teaching. The professional development seminars arranged for us focused on the practical processes exhorted in *Computers as Tools for Teaching and Learning*: *A Planning Resource for Schools and Teachers*. There was no encouragement within schools for professional dialogue or deliberation about any implied educational or philosophical basis for this initiative, or indeed, questioning of whether there *was* one.

Early Enthusiasm, Early Doubts…

Thus the documents arrived into our schools, thrust into our hands. Powerlessly, we carried on with the instruction to use computers in our classrooms. Perhaps Brian Algar, a key teacher at River Oaks in Canada, cited by the DECCD, over and again, to justify the teaching and learning approach advocated was meant to comfort us. "At River Oaks computing tools are nothing special, they are just there and transparent, and their effect has been huge" (DECCD, 1997a, p.2).

Were we to simply accept this view of the 'neutral' role of computers in classrooms? Was this simple statement sufficient to assume a philosophical and educational justification for computers in classrooms by the DECCD documents (1997a and 1997b)?

Lewis Perelman predicts in *School's Out: Hyperlearning, the New Technology, and the End of Education*,

> A technological revolution ... is totally transforming the social role of learning and teaching. This learning revolution already has made the 'classroom teacher' as obsolete as the blacksmith's shop...the nations that stop trying to 'reform' their education and training institutions and choose instead to totally replace them with brand new, high-tech learning systems will be the world's economic powerhouse through the twenty first century. (Perelman, 1992, p. 20)

Though I was enthusiastic and excited by the new educational world offered to students and schools generally, and by the challenge of changing my practice to use computers to "access, extend, transform, and share" (DECCD, 1997a, p. 1), I found myself rejecting Perelman's prediction. I was mindful that there had been other 'technologies' that were full of promise and had had very short 'lives'. Writing in 2004, David Hutchison recalls, in his book, *A National History of Place in Education*, a claim Thomas Edison made in 1922.

> I believe that the motion picture is destined to revolutionise our educational system and that in a few years, it will supplant largely, if not entirely, the use of textbooks. The education of the future, as I see it, will be conducted through the medium of the motion picture. (Edison in Hutchison, 2004, p. 111)

Whilst motion pictures, radio and television share a critical limitation, that is, the one-way transmission of information from source to student, Hutchinson, states that computer proponents are still claiming that computers, as interactive technologies, can "respond" to student needs as they are deemed to be infinitely "patient" and therefore ideally suited to matching the varied learning paces of students (Hutchison, 2004, p. 114).

My initial approach to allocating student access to computers was to allow an equal amount of time. I eventually decided to allocate according to 'student need', defined as access to literacy and numeracy skills reinforcement programs, and extension programs for those who finished their work early. Although I provided some instruction in their use, as in my 1994 'Computer Immersion' trial, when students developed knowledge and experience they were encouraged to help their peers. Some students (most often the girls and the more 'timid' boys), perhaps due to lack of confidence or embarrassment about their perceived inabilities, ceded their time to those who they saw as being more able, with the effect that the more assertive and capable students gained more access. I observed subtle changes in student relationships as they worked together around the computers, sharing and co-operating as well as arguing about whose turn it was next.

Some of the literacy and numeracy software programs were bright and colourful and initially exciting for my students. As time went on, my enthusiasm and that of most of my students waned, as the software became familiar and routine. Word processing was often slow and frustrating as the students did not have the necessary typing skills. I was searching for ways to make use of the computers in the curriculum, for example, inserting clip art into word documents and PowerPoint presentations, but these were artificial. I was often concerned that my students seemed to be 'wasting' time just using the computers 'because they were there' or taking opportunities to

‘surf’ aimlessly. Internet filters reduced but did not wholly eliminate the risk of viewing inappropriate material.

Computers now occupied areas that were previously used for other purposes, for example, mat space, flexibility of desk groupings, and extra space for students to interact with each other. This changed the physical, personal and social relationships between all the individuals in the classroom, students and teacher. The reality underlying the prescribed use of computers in my classroom challenged my beliefs and practices. Perhaps as Hutchison suggests, I resented the incursion into my personal, philosophical and educational ‘place’. “The meaning of places may be rooted in the physical setting and objects and activities, but they are not a property of them – rather, they are a property of human intentions and experiences” (Hutchison, 2004, p. 114).

As time passed, the tension between what I had hoped for, and what was actually happening with computers in my classroom increased. The value of the activities the students were undertaking, perceived and suggested by *Computers as Tools for Teaching and Learning* did not sit comfortably with my educational understandings, my classroom strategies, and teaching style. My beliefs and practices inevitably influenced not only the ways in which I used computers, but also the approaches I used most often. Whilst our society expects that students will be able to ‘function in the future workforce’ and in society generally, I was concerned that we were moving in a direction that might not be educationally wise. Therefore, I continued to give priority to the learning needs of the students and treated the use of computers as a secondary concern.

This gave rise to a feeling of guilt that I was not incorporating computers into my teaching practice as expected, and there was pressure for me to avoid earning the label of ‘Luddite’. This was a term, a label, that one feared. To be seen as being ‘progressive’ by colleagues and parents was stressful. I found myself increasingly struggling with questions like: Where do classroom teachers fit into the world of rapidly changing technology? Is our developing view and use of computers changing our view of humanity? How does the mental set of teachers change over time, and how does that affect their practice? I questioned the fact that the DECCD approach

was apparently based mainly on Brian Algar's experience at River Oaks, without having considered some of the wider implications which emerged from the experiences of teachers and from readings, such as those I examine in this inquiry.

First, I came to question the assumption that computer technology will provide the 'solution' to perceived 'problems' in education, to improve literacy and numeracy levels. Larry Cuban's statement in *Oversold & Underused: Computers in the Classroom* might have been shocking for others but not for me. It was ringing true in my ears.

> The introduction of information technologies into schools over the past two decades has achieved neither the transformation of teaching and learning nor the productivity gains that a reform coalition of corporate executives, public officials, parents, academics, and educators have sought. (2001, p. 195)

Secondly, I came to believe that it is important to understand the wider social, economic, human and educational implications that information technology has on schools, and *vice versa*, as well as the importance that information technology attributes to the success or otherwise of individual students, during their school life and for their future work opportunities. I found myself quietly talking first, to my closest colleagues, and then in full voice at staff meetings. I was perhaps becoming one of Postman's "dissenting voices".

> While technophiles see only what new technologies can do and are incapable of imagining what they will undo... A dissenting voice is sometimes needed to moderate [this approach]...For it is inescapable that every culture must negotiate with technology, whether it does so intelligently or not. (Postman, 1993, p. 5)

Thirdly, I learned that we must also be mindful of the profound effect that existing and anticipated technologies generally have on virtually every aspect of our economic, social, and intellectual lives as warned by Joseph Weizenbaum in his book, *Computer Power and Human Reason: From Judgement to Calculation,* when

he says,

> ...the instruments that man uses become... extensions of his body. Most importantly, man must, in order to operate his instruments skilfully, internalise aspects of them in the form of kinaesthetic and perceptual habits. ... The introduction of computers into our already highly technological society has merely reinforced and amplified those antecedent pressures that have driven man to an ever more highly rationalistic view of his society and an even more mechanistic image of himself ... the computer ... can be seen as a particular kind of encoding of a much larger impact, namely, that of a man's role in the face of technologies and techniques he may not be able to understand and control. (Weizenbaum, 1976, pp. 9-11)

And finally, I found ways to critically review the ideas that seemed to be driving the use of computers and associated software in schools, like commercially produced textbooks and other resources, software programs influence and even create the taught curriculum. Steinberg and Kincheloe, in their book *Kinder-Culture: The Corporate Construction of Childhood (*1998), suggest that the influence of commercial agencies has always been present in schools and not necessarily detrimental. Indeed, the business community has initiated, sponsored or otherwise supported some very important programs and initiatives. I wince at Steinberg and Kincheloe's claim that the use of computers in schools has a cross-curricular impact on a scale hitherto unseen. Software such as Microsoft Office™ is developed primarily for commercial, not educational, use. Whilst the benefits of these packages are recognised in terms of their accessibility (preinstalled on most hardware), their widespread use in commercial life, and their international compatibility, I want to argue, with Steinberg and Kincheloe that such commercial packages influence the structure of teaching. By 'steering' students through the conventions of these word-data-presentation-processing programs, the software predisposes students and teachers to adopt commercially targeted, rather than pedagogically-based protocols and strategies within and beyond the classroom.

Each technology, whether print or computer, brings about a new mentality, a new way of considering things.

> When students learn to use a computer, they are not just learning a skill. They are changing the relationship between themselves and the world around them by the way in which information is accessed, the manner of its presentation, and the way in which it can be manipulated alters a student's perceptions of 'knowing and doing'. (Armstrong & Casement, 2000, p. 11)

My emerging view is that, unlike Algar's contention, computers are not "just tools" and they are not "transparent" (DECCD, 1997a, p. 2), they actually have profound consequences on how we relate to each other, our human activities and therefore the ways we educate our children. In further chapters, as I discuss the two DECCD documents, I explore such consequences, question them, seek the views and questions of others and attempt to come to a deeper understanding of my role, place and situated self as the orientations of education change with the roll-out of computers.

Chapter 3

From Clubs and Spears to Constellations of Technologies

We humans have always been inventive. We have had to survive physically, emotionally and spiritually. Through the ages, our inventions have formed complex cultures with complex technologies. Our technologies illustrate the history of our human activity from the times when we were hunters and gatherers many thousands of years ago. Historians have most often referred to our technologies as 'tools'. Our simple tools have evolved into 'more sophisticated technologies'. Our latest are associated with hardware, software, networks, blue tooth, wireless and communication, local and global. This chapter offers a history of technological developments from the perspective of Postman's (1993) technological cultures, and considers some implications of technological developments from Winner (1986), Ihde (1993), Weizenbaum (1976), Beyer and Apple (1998), and others.
It also opens some possibilities for thinking about the question what is education for in these technological times?

In his book *Philosophy of Technology, an Introduction*, Don Ihde (1993) suggests how we either found or discovered our first technology. Our ancestors picked up a stick and used it as a club. Then they modified and adapted this technology for other functions. For example, by smoothing and straightening the sticks and hardening the tips, our ancestors used them for spears. Tools were invented to meet a specific need, for example, to extend our 'reach' as hunters and warriors we invented bows and adapted our existing technologies, spears, into arrows.

The development of our technology has occurred synchronically and in a non-linear way. Ihde (1993) offers the concept of three "deep and broad technologies" – Time, Space and Language – to illustrate early technological revolutions that have transformed entire cultures.

Our ancestors named the star patterns or constellations after animals or deities, which enabled them to be recognised and observed the next time they came around.

Today we can see examples of prehistoric structures at Stonehenge or New Grange that marked the location of the sun at given times of the year and, together with lunar calendars and sundials, marked the passing of the years, months and daylight hours. Pre-literate inscriptions marked the passing of time on other artefacts such as reindeer horns. Later, mechanical clocks registered minutes, seconds and, most recently, nanoseconds, and became the standard tool for quantifying, standardising and, in Ihde's terms, "technologising" time.

Later, in an industrialised society, time became a "dominating and controlling force." For example, once people farmed only during daylight and according to the season. Mechanisation and agricultural advances in indoor cultivation led to shift work, regardless of the time or season. The "natural clock of the sky" came to serve an additional purpose: to guide navigation and to record distance travelled, for example, in the terms, "three days' sailing." With the recording of time, observation of the stars became formally recorded as astronomical charts, plans, diagrams and maps. Subsequently, we have come to anticipate what we cannot see, but know to be there. Much later, we see that our computer simulations "chart" outer space. In these ways, Ihde illustrates how the constellations represent an example of a "found technology" which served to "locate" man within Time and Space.

Just as the technology of inscribing and writing enabled humans to record Time and Space technologies, so it was with Language. Ihde suggests that the technology of writing marked the decisive move from a pre-historic to historic era, as it exemplifies the "cultural embedment of technologies" (1993, p. 58).

Manufacture became progressively more mechanised. Machines with their mechanised tools took over more and more of man's tasks and made the mechanical tools do more and more of what man had formerly done. This progression culminated in computer technology used to calculate and present numerical data; record, order and store information of all kinds: prints, images, and sounds; add data loggers and cameras to capture 'events'; and produce computer-aided design and manufacture. By the end of the twentieth century our personal computers, smaller than a briefcase, could run programs to carry out most of our work. Computer technology promised us a new world: increased productivity, improved quality of

life, a shorter working week, more leisure time, better health care and “spare-part surgery” to extend our life expectancy beyond 100 years.

Framework of Technological Cultures

Ihde states that all cultures are technological, insofar as they have embedded the use of tools into their way of life in a variety of ways. Almost all cultures have developed a variant of basic technologies,

> ...as in the tools and tool context for such human praxes as food gathering, preservation and preparation, storage and weaponry, all of which we intuitively place in our usual inventories of technology. (1993, p. 58)

Whilst all technologies are culturally embedded, Ihde suggests that there are differences between cultures.

> The point here is that, within the long human-technological history, there is a ‘universal’ occurrence of human-artefact relations, but a particular and culturally diverse set of praxes which revolve around the same processes (cooking, storage, preservation). (1993, p. 50)

As a result, cross-cultural exchanges have frequently been the means of high technological innovation and development. The invention and use of tools do not leave humans untouched. Tools shape the way human beings interact with reality, says Ihde. Such tools reflect the experience of other people, who have tried to solve similar problems at an earlier time, and have invented or modified the tool to make it more efficient. This experience is accumulated in the structural properties of tools, in their shape and in the materials used, as well as in the knowledge of how the tool is used. The development of the activity itself creates the form of the tools, which then carry with them a particular culture as “the historical remnants from that development” (Ihde, 1993, p. 40).

Tools become the means for the accumulation and transmission of social knowledge, influencing the nature, not only of external behaviour, but also of the mental functioning of individuals. Weizenbaum (1976, p.18) notes that there can be no "general-purpose tools," whilst Ihde argues that particular tools inevitably select, amplify and reduce aspects of our experiences in various ways that have implications over time for the environment and for all technologies, large or small, and raise philosophical questions of isolating "the variable and the invariable" features of those transformations (Ihde, 1993, p. 53).

Is environmental degradation on a global scale a result of modern technology or the cumulative effect of all previous technologies? For example, early man cleared the land to graze his stock and cultivate the family's food. Nomadic lifestyles minimised over-grazing and protected the land from degradation. Centuries later, enhanced technologies allowed for cultivation to be carried out on a commercial scale, resulting in environmental degradation.

Using the simplest technologies of stone and levers, early humans made major modifications to their environment, for example, constructing the pyramids of Egypt and the Great Wall of China. Technology has increased the scope and scale of man-made changes to the environment with tower blocks, factories, power stations, motorways and airports. I continue to examine such hypotheses and questions as I explore ways of understanding how technologies have intruded into the lives of humans.

Neil Postman, writing in the same year as Ihde, 1993, identifies three "technological cultures: Theocracy, Technocracy and Technopoly." Different relationships between humans and technologies characterise each of these cultures.

As I explore these relationships further, in terms of the necessary conditions for, and the unintended consequences of, the implementation of particular technologies, I become concerned about notions of neutrality that others, like policy makers in education, attribute to technologies.

Theocracies or Tool-Using Cultures

Postman's three technological cultures show considerable variation in the tools that were available at different times. Some people had only spears and cooking utensils, whilst others had water mills, coal, steam railway and horsepower. Tool-using cultures are not necessarily technologically impoverished; they may be surprisingly sophisticated. Postman points out that the range of technologies available and the society's attitudes towards the tools (enthusiasm or contempt) are not the defining characteristics of a tool-using culture. He says,

> The main characteristic of all tool-using cultures is that their tools were largely invented to do two things: to solve specific and urgent problems of physical life... or to serve the symbolic world of art, politics, myth, ritual and religion. (Postman, 1993, p. 23)

Within tool-using cultures, says Postman, technology is not independent of, but subject to the jurisdiction of the relevant social or religious systems, which, in turn, derive from each society's belief system or ideology. Medieval theologians developed an "elaborate and systematic" description of the relation of man to God, man to nature, man to man, and man to his tools.

> Their theology took as a first and last principle that all knowledge and goodness came from God, and that therefore all human enterprise must be directed to the service of God. Theology, not technology, provided people with authorisation for what to do or think. (Postman, 1993, pp. 25-26)

Tool-using cultures were theocratic, in that theology directed which tools were invented and how they were used so that tools could be integrated into the society in ways that did not significantly contradict the society's ideology. Despite theological control, new inventions came to threaten the society's ideology and structure. According to Postman, an important example of a technological disruption to a tool-using culture came in the eighth century with the introduction of the stirrup. A powerful new military technology with far reaching ramifications, the stirrup

allowed armies to fight on horseback. This new form of combat enhanced the importance and status of the knight class and changed the nature of Feudal society. A later example is the transformation of the mechanical clock in the fourteenth century "from an instrument of religious observance to an instrument of commercial enterprise. Charles V required that the church align its 'summoning of the faithful' mechanism to the secular clock" (Postman, 1993, pp.26-27).

As humans became more mobile, their inventions changed not only the society within which they were invented but increasingly, changed other societies as well. Postman shows that, as a "far reaching and chilling" example of technological disruption to a culture, the replacement of bows and arrows with the rifle led, in particular, to the eradication of the native Canadian Ihalmiut Indian tribe in the early twentieth century (1993, p. 28).

Technocracy

Tool-using cultures are characterised by the lack of technological intrusion into belief systems or ideologies. Over time, scientific discoveries led to a fundamental subversion of the ideology and organisation of society, creating a culture, which Postman called "Technocracy", where human success is determined by the adoption of technology. He distinguishes a tool-using culture from a Technocracy, by suggesting that, in a Technocracy, tools play a central role in the "thought-world" of the culture: everything must give way in some degree, to the development of tools.

The social and symbolic worlds become increasingly subject to the requirements of that development. Tools are not integrated into the culture; they attack the culture. They bid to *become* the culture. As a consequence, tradition, social mores, myth, politics, ritual, and religion have to fight for their lives (Postman, 1993, p. 28).

Postman says that modern technocracies have their roots in medieval European times. Like Ihde, he illustrates the significance of the mechanical clock and the printing press of movable type in creating a new "technological culture". He adds a third invention, the telescope, which, in his view, "attacked the fundamental propositions of Judeo-Christian theology" (Postman, 1993, p. 29). Whereas, at that

time, understanding of the world and the heavens was based on biblical teaching, the development and use of the telescope enabled early scientists, like Copernicus, Kepler, and Galileo to make independent observations. Kepler was one who called for a distinction between moral and intellectual values in society, thereby expressing what Postman describes as one of the key characteristics of a Technocracy. However, Postman argues that although the discoveries of Copernicus, Kepler, Galileo, Descartes and Newton founded Technocracy, their religious belief and their pursuit of truth, rather than power or social change, made them men of tool-using cultures, or Theocracy (Postman, 1993, p. 36).

Technocracy promoted the idea of progress with the promise of "new freedoms and new forms of social organisation", and, as such, diminished or subordinated the connection with political and spiritual tradition and the wisdom of elders. By the nineteenth century, "…holy men, sin, grandmothers, families and regional loyalties and two thousand year-old traditions, [were] antagonistic to the technocratic way of life" (Postman, 1993, p. 46).

According to Postman, Technocracy had its beginnings with Adam Smith (1776) who argued that money, through the self-regulating market, was the key to wealth. Thus Smith justified the transformation from small scale, personalised, skilled labour to large scale, impersonal, mechanised production, for example, steam driven looms, trains for the transportation of goods and people, and large scale engineering projects. The mechanisation of manufacture allowed for objects to be made faster and therefore, cheaper. As a result, the human-technology relationship changed significantly, in terms of time, place, process, the values and feelings of those involved, new values of profit, reward, the common good, community, and responsibility philanthropy.

The new physical working environment required people to work away from home in specialised buildings such as factories. Reliable lighting allowed factories to run for twenty-four hours a day, requiring people to work in shifts to reduce the cost of the start-up and close-down of machinery. At work-stations or in assembly lines, workers were virtually an extension of the machine. The production line involved individuals, as part of the process, not to take responsibility for making the

completed product. This resulted in a degree of de-skilling and a shift in values, away from pride in craftsmanship, towards efficient and economic production. Postman explains,

> In a Technocracy, that is, a society only loosely controlled by social custom and religious tradition and driven by the impulse to invent an 'unseen hand' will eliminate the incompetent and reward those who produce cheaply and well the goods that people want. (1993, p. 41)

These changes brought with them a range of direct, albeit unintended, consequences, both beneficial and harmful. 'Benefits' for workers ranged from the provision of housing near the factories, free coal for miners, and community services provided by philanthropic factory owners such as Cadbury, Lever and Rowntree. Progressively, workers' tasks could be carried out more quickly, and mechanisation led to a quicker method of production and a shorter working week for workers. The pressure on workers to keep up production rates often induced work-related injuries and respiratory illnesses, in mines and cotton mills for example. Demand for skilled as well as less skilled workers reduced as more sophisticated technologies were invented.

Stephanie Mills suggests in her book, *Turning Away From Technology, A New Vision for the 21st Century* (1997), that the Luddites, weavers who had lost their jobs at the beginning of the Industrial Revolution, were the first to make it clear that there can be such a thing as "inappropriate technology: machines and systems of machines that sacrifice the public good to enrich a selfish few" (p. viii). She surmises that the Luddites "might have settled for a living wage and some job security...[Had] their grievances been met with a fair response, they might well have deemed steam technology beneficial" (p. viii). Over the next century, workers' open discontent with their pay, conditions, lack of control over their lives and job satisfaction obliged employers to enhance salaries, benefits and working conditions. The discontent of workers must also have been fired by their employers' lack of respect for their craftsmanship and human purpose.

Citizens of a Theocracy and Technocracy valued the philosophies of their traditions and knew that science and technology did not provide philosophies to live by. According to Postman, they believed that

> ... for all their dependence on machinery, tools ought still be their servants, not their masters...And though technocracy found no clear place for the human soul, its citizens held to the belief that no increase in material wealth would compensate them for a culture that insulted their self respect. (1993, p. 46)

Though these new technologies were challenging world-views about a tool-using culture, there remained a respect for peoples' dignity and humanity. Postman believes that his third culture, Technopoly, significantly changed these world-views.

Technopoly

Technopoly is Postman's term for "Totalitarian Technocracy" (1993, p.48), something which involves the "submission of all forms of cultural life to the sovereignty of technique and technology" (p. 52). Both a state of mind and a state of culture, Technopoly is an "affliction of individuals and societies in which technology becomes the chief source of authority, definer of life-goals and provider of satisfaction."

Technocracy becomes Technopoly, says Postman, "when tools win the battle for dominance and become the sole determiners of a culture's purpose and meaning and in fact of its very way of knowing and thinking or of not thinking" (p.55). The tools not only 'use' humans but they define what and who they are, which is why, in Technopoly, there cannot be a "transcendent sense of purpose of meaning, and no cultural coherence" (p.63). In Technopoly, the primary goal of human labour and thought is efficiency, and technical calculation is deemed superior to human judgment in all respects. In Technopoly, continues Postman, "subjectivity is an obstacle to clear thinking; ... what cannot be measured either does not exist or is of no value; and ... the affairs of citizens are best guided and conducted by experts" (p. 87).

Following Postman, Mills (1997) suggests that communication technology [computers] was not only non-neutral but totalitarian, allowing the expansion of "transnational corporations and bureaucracies that condemned citizens either to dumb passivity or to impotence and frustration." In some ways, what Mills says here supports Postman's concept of Technopoly. In 1997, Mills was alarmed about the negative effective of some technologies.

> If every technology, being a form of power, has implicit values and politics, to say nothing of synergistic effects with other technologies and institutional forms, why, we asked ourselves, is there not more wrenching public debate about what technology does to life and polity, as form reduces – really atomises – content, then hastens to fill this void with semblances of gadgetry?
> (p. 177)

Postman saw a society that was no longer merely using technology as a support system but was instead being shaped by it with "radical consequences for the meanings of politics, art, education, intelligence, and truth." (1993, p.177)

> Technopoly consists of the deification of technology, which means that the culture seeks its authorization in technology, finds its satisfaction in technology, and takes its orders from technology. (p.41)

Postman's examples of Technopoly include doctors who perform unnecessary operations simply because the technology is available, politicians who determine policy exclusively on the basis of polls, TV programs that are 'good' because their ratings are high, corporations that are run "hierarchically, inhumanely and often badly" and, perhaps most significantly, computers, which Postman describes as "the dominant metaphors of our age" that have led to the redefinition of "humans as information processors and nature itself as information to be processed" (p.111).

The Computer: The Dominant Metaphor of Our Age

The key symbol of Technopoly, asserts Postman, is the computer, it makes most people 'losers' because it confers power and knowledge on only a few. We can see this happening today in 2008. Government and commercial organisations increasingly provide information, list terms and conditions, and invite applications and payments primarily on-line. This must, of course, assume that everyone has, and knows, how to use computers for such purposes.

Indeed Ihde suggested in 1993 that technologies, by substituting technical solutions for human ones, have the potential to change our whole existence or the "very parameters of life beginnings and life endings, as well as what happens in between" (p.68). Does computer technology serve to strengthen Technopoly's incursion into our world? Postman further argues that, computer technology has served to strengthen Technopoly's hold. Do ordinary people believe, like Postman, that "technological innovation is synonymous with human progress" (p.177)? These are important questions for this thesis because their underlying conditions and beliefs determine some of the ways I reflect upon the introduction of computers by the state government into Tasmanian classrooms.

In the meantime, I will continue with Postman, Weizenbaum, Winner, Bowers, and some others, who allow me to pursue one other question: What are the implications for our society as the role of technology increases? Postman suggests that

> Technopoly is a state of culture. It is also a state of mind. It consists in the deification of technology, finds its satisfaction in technology, and takes its orders from technology. This requires the development of a new kind of social order, and of necessity leads to the rapid dissolution of much that is associated with traditional beliefs. (1993, p.71)

The status accorded to computer technology in society is wide-ranging. One socially significant question that Weizenbaum (1976) raises is over the proper place of computers in the social order that "whilst there are important differences between

men and machines as thinkers, there are some acts of thought that ought to be attempted only by humans." The issue transcends computers in that it must ultimately deal with logicality itself quite apart from whether "logicality is encoded in computer programs or not" (p.13).

C.A. Bowers, in his book, *Let Them Eat Data* (2000), complains that the discussion of computers in schools on both local and national levels has been too narrow, and he specifically laments the lack of discussion about cultural and environmental issues.

In *The Whale and the Reactor* (1986), Winner writes of the dangers of "technological somnambulism". He suggests that it might be better to hesitate before employing new technologies, to see what possible harm they may cause. He speaks critically of our "religion of progress" and of the possible loss of "qualities" with new technology. He considers that "technological development proceeds steadily from what it has already transformed and used up towards that which is still untouched" (pp. 170-174).

The Non-Neutrality of Technologies

Postman's notion of technology as an autonomous force acting on its users, presents technology as non-neutral. He suggests, "the uses made of technology are largely determined by the structure of the technology itself" (1993, p. 25). Ihde, too, takes up this notion and suggests that the nature of the various technologies involved and their relationship to the humans who use, design, discard or modify them, shape the cultural context into which the technologies are introduced. He suggests, "medical technologies and hygiene practices, relating to food and water supplies, are a positive example of the benefits of technology" (1993, p. 53).

Winner (1986) says that technologies are not simply neutral tools for human use and that the effects can be positive as well as negative. He uses an example from the 1970s when people with disabilities pointed out the many ways in which machines, instruments, and structures in common use prevented them from moving about freely, excluding them from social and public life. Once these issues came to public

awareness, people became more able to cross what were previously social and physical barriers. Winner insists that the medium itself contains an ideological bias. Whatever you use has an effect on what and how you perform a task, so the idea that "a computer is just a tool disregards the design, purpose and nature of the computer which requires specific responses, ways of thinking, particular actions and mindset" (p.171).

Technologies are sometimes designed, deliberately or not, says Winner, to open or close certain social options. Some technologies may be more compatible with some social patterns than with others. He uses the example of Robert Moses, bridge and road builder in New York from the 1920s to the1970s, who designed bridges so that buses could not pass underneath, restricting access to popular beach holiday areas by racial minorities and low income groups without cars.

For Winner, technologies create forms of life, "Gestalts", a person's thoughts and experiences as a whole, more than the sum of their parts, which are non-neutral, but the way in which they come into being is not simply causal, at least not in a linear way. Winner's perspective sees humans implicated in and taken into technological systems. Therefore, the construction of a technical system that involves human beings as operating parts brings a reconstruction of social roles and relationships.

Winner explores the political, social, and philosophical implications of technology, arguing that choices about the kinds of technical systems we build and use are actually choices about who we want to be and what kind of world we want to create. Where building advances allowed for the building of tower blocks for social housing, such as by Cadbury and Rowntree, chocolate factory workers could be well housed in their own separate communities. Technical decisions are political decisions, argues Winner, involving "profound choices about power, liberty, order, and justice" (1986, p. 23).

Designed social control raises issues of who and what holds power in our society. Whilst insisting, "technology is a means not an end," Brian Street in *Literacy in Theory and Practice* (1984), too, sees technology as non-neutral. He argues that

> ...the choice of means always carries consequences which are not identical with the original purposes involved as the material manifestations of social relations, tools are concrete commitments to certain ways of doing things, and therefore certain ways of dividing power. (Cited in Chandler, 1995, p.219)

Carol Pursell in *White Heat* (1994) has noted that there is another sense in which technologies are non-neutral, and that is in their cultural symbolism. She uses the example of the throwaway Coke bottle in the movie, *Gods Must be Crazy*, which tells of a Coke bottle falling from an aeroplane amongst bush people in the Kalahari Desert and the subsequent disruption to their traditional way of life. The Coke bottle, like all technologies, reflects particular cultural values that can be misused or misunderstood
(p. 29).

Daniel Chandler, in *Technological or Media Determinism* (1995), insists that technologies are not neutral in the sense that they are not asocial. They cannot be detached from specific social contexts. “Technology is not a neutral ‘thing’ that arises out of disinterested scientific inquiry. It is itself a social product that has arisen as a result of political and ideological processes and institutions and its particular form has to be explained in terms of such processes” (p. 65).

Chandler (1995) suggests that some critics argue against technological non-neutrality (determinism) on the grounds that technology is neutral or “value-free”, neither good nor bad in itself, and that what counts is not the technology but the way in which we choose to use it. Technology is presented as amoral. If we choose to use technologies for repressive rather than liberating purposes, that is our choice.

Jacques Ellul wrote, in 1994, that we cannot merely ‘use’ technology without also, to some extent, being influenced or being ‘used by’ it. He, like Chandler, dismisses the neutralist idea that whether or not technology has good or bad effects, depends on how it is used. “Technique carries with it its own effects quite apart from how it is used. It does not matter how it is used; it has of itself a number of positive and negative consequences. This is not just a matter of intention” (Chandler, 1995, p.

35). Ellul adds that “technical development is neither good nor bad, nor neutral” (1990, p. 21), we become conditioned by our technological systems or environments. In this technical sense, tools are not neutral and their use may contribute to shaping our purposes. This is Postman’s point when he says, “To a man with a pencil, everything looks like a list. To a man with a camera, everything looks like an image. To a man with a computer, everything looks like data” (1993, p. 14).

Technologies bring us to face new thresholds for the future of our humanity when, for instance, genetic engineering and the possibility of founding human settlements in outer space, calls upon us to question what it means to be human and what constitutes the human condition, and to consider how such developments change the texture of everyday existence.

Winner (1986) acknowledges the impact that technology has upon the human psyche, and weighs it against what he calls the “often frightening consequences of technology” (p.116), suggesting that we must require rational limits on technological research and development, in which technology needs to be seen within a broader context. He points out the danger that computer technology poses in issues of civil rights and privacy, this “benign surveillance”, will cause people to opt for “passivity and compliance” as the safest route, rather than participating in activities that once represented political liberty (p.116). Linking computers and telecommunications recasts basic structures of political order. Once, crucial conditions created by spatial boundaries of political societies were never in question (pp. 115-117).

Thus Winner comes to ask, “How can we limit modern technology to match our best sense of who we are and the kind of world we would like to build?” A “basic task for a philosophy of technology would be to examine critically the nature and significance of artificial aids to human activity” (p.3). Winner asks why a philosophy of technology has never really developed. “Why has our culture, so firmly based upon countless sophisticated instruments, techniques, and systems, remained so steadfast in its reluctance to examine its own foundations” (1986, p. 5)?

Bonnie Nardi suggests that artefacts are mediators of human thought and behaviour: “they do not occupy the same ontological space” (1996, p. 8). People are not reduced

to “nodes” or “agents” in a system, and “information processing” is not seen as something to be modelled in the same way for people and machines. She maintains that any activity cannot be understood without understanding the role of artefacts in everyday existence.

> Activity is concerned with practice, that is, doing and activity, which significantly involve the mastery of ... external devices and tools of labour activity. Human activity is mediated by artefacts– tools both internal and external. These tools may be signs, language, instruments or machines. They are created by people and effect control over behaviour. (Nardi, 1996, p. 26)

According to Nardi tools shape the way human beings interact with reality and reflect the experiences of other people who have tried to solve similar problems at an earlier time, inventing or modifying the tool to make it more efficient. The structural properties of tools such as shape, materials, as well as the knowledge of how the tool should be used, embody this experience. The development of the activity itself transforms tools so that they carry with them the particular culture and the historical remnants from that development. Nardi states, “The use of tools is a means for the accumulation and transmission of social knowledge. It influences the nature, not only of external behaviour, but also of the mental functioning of individuals” (1996, p. 5).

Writing about the same time and topic as Nardi, Liam Bannon (1995) suggests that certain human needs drive activities where people wish to achieve a certain purpose. These activities are normally mediated by one or more instruments or tools as an activity is mediated with artefacts, such as the carpenter using a hammer to drive a nail, or a nurse using language and records to co-ordinate her actions towards the patients and each other. Tools are means to divide work, establish norms and language, which can all be seen as artefacts for the activity: humans make them and they mediate the relations among humans or between humans and the material or product.

Martin Ryder (1995) makes a similar note of the inextricability of tools from their human makers. He emphasises the human person as the subject creating or acting on the object. A human agent (the subject) who is motivated towards the solution of a problem or purpose (object) undertakes an activity mediated by tools (artefacts) in collaboration with others (community). The structure of the activity is constrained by cultural factors including conventions (rules) and social strata (division of labour) within the context. Thus Ryder shows that in most human contexts we mediate our activities through using culturally established instruments, including language, artefacts, and established procedures.

This applies to environmental matters, as Bowers (2000) recognises when he says that computers have been used for environmental action and cultural conservation. He quickly dismisses such activities as unable to justify computer use in education. For Bowers, environmental software can further the illusion of computational neutrality with respect to the environment that could deflect attention from the real problems inherent in the environment.

Environmental issues, knowledge of place and how this is threatened by computers and technology is deeply embedded in personal experience and is understood as an intergenerational responsibility that also includes knowing who were the earlier inhabitants, their technology and economy, and the poetic (making of myths) narratives at the base of their moral community. It also involves knowledge of immediate ancestors and what they learned or failed to learn as they built their community on the moral and conceptual baggage they brought with them in their immigration. We receive this knowledge through stories of their previous experiences with the land. (Bowers, 2000, p. 64)

This is Postman's point when he discusses his notion of Theocracy, where the essential knowledge of how to take care of a particular environment is learned from the people who have come to grips with the demands of the land. Thus, the experienced members of a cultural group, those who possess the "elder knowledge", hold the key to ecological sustainability in any given region. This is the knowledge that is devalued by science and computers. It is not easily abstracted, generalised, digitised, or turned into data. The individualism reinforced by computers reacts

against cultural restraint. Computers, in demanding abstraction and promoting individual autonomy, devalue local, elder knowledge.

For Bowers, an autonomous individual is not subject to tradition, and cultural tradition often contains the wisdom of how to live in harmony with local environments. This might serve as a reason to keep children away from computers in a society where there does exist a tradition of ecologically sustainable elder knowledge.

Vygotsky (1978) also has a view on this when he states that an individual never reacts directly to the environment, but the relationship between the human agent and the object is mediated by cultural means or artefacts. The basic types of these cultural means are signs and tools. He suggests,

> ...during socialization, an individual internalizes, by participating in common activities with other humans, the means of culture: language, theories, technical artefacts as well as norms and modes of acting. Thus consciousness doesn't exist situated inside the head of the individual but in the interaction, realized through material activity, between the individual and the objective forms of culture created by the labour of humans. (p. 40)

Postman suggests that we, as humans, have a very strong cultural link through language, as the words we use and understand often have deep rooted cultural meanings. But many of our words are being given new meanings and understanding. He states that

> ...the transformation of old words that has deep rooted meanings brings about changes in our social and cultural understandings. The old words still look the same, are still used in the same kinds of sentences. But they do not have the same meanings; in some cases, they have opposite meanings. In this way, computer terminology is used for human interactions and that this process takes place without our being fully conscious of it. We 'touch base, impact on, input, interact, and interface'; Thus it is insidious

> and dangerous, quite different from the process whereby new technologies introduce new terms to the language, such changes occur quickly' (1993, p. 8).

Postman argues that because of the symbolic forms in which information is encoded different media have different "intellectual and emotional biases." Also because of the accessibility and speed of their information, different media have different "political, social, economic and technical biases" (1993, p. 193). He insists that the printing press, computer, [radio], and television are not simply machines which convey information. But they are,

> ... metaphors through which we conceptualize reality in one way or another. They classify the world for us, sequence it, frame it, enlarge it, reduce it, and argue a case for what it is like. Through these metaphors we do not see the world as it is. We see it as our coding systems are. Such is the power of the form of information. (p. 39)

I think that these "intellectual and emotional biases" have significant implications for computers in classrooms. I often heard my students speaking of their computers in human language terms that we associate with computers like 'the computer is thinking' or 'is asleep' or 'checking', 'remembering'. We speak of the 'computer's brain'. We 'apologise' to the computer for our mistakes. We tend to confide our innermost secrets to the computer hard drive.

The other aspect of language that has a far-reaching impact on us relates to computer programming and software development. As Beyer and Apple make clear, a computer language is not a language in the traditional sense of the term that is, expressive, intentional, and connotative as well as denotative and based on qualitative knowing, "but rather a set of syntactical notations to control computer operations. Hence, a computer's expressive potential only extends over the syntactic dimension of its formal operations" (Beyer & Apple, 1998, p.52).

Postman writes of the danger that much of the harmful impact of Technopoly is embedded in the way in which machines have become key metaphors, whose increasing presence subtly engineers important differences in meaning and outlook. This was demonstrated earlier by Weizenbaum (1976) who developed ELIZA, a program consisting mainly of general methods for analysing sentences and sentence fragments, locating so-called keywords in texts, assembling sentences from fragments, and so on. ELIZA creates the illusion of having understood a conversation, as people think they are having a conversation with a human being. Weizenbaum explains,

> I composed a computer program with which one could 'converse' in English. The human conversationalist partner would type his portion of the conversation on a typewriter connected to a computer, and the computer under the control of my program, would analyze the message that had so been transmitted to it, compose a response to it in English, and cause the response to be typed on the computer's typewriter. (1976, p. 2)

Postman's technological cultures, Winner's warning of technological somnambulism or Weizenbaum's concern about what computers can do and what they cannot do and what they should not be used to do, were not considered by the DECCD in the literature review. Nor was Ihde's warning that technology can no longer be taken for granted, as its impact on and implications for the social, ethical, political and cultural dimensions of our world must be considered and addressed.

Thinking about the philosophical, educational and social implications of what it was we were introducing into classrooms and the unintended consequences, was omitted from the DECCD's deliberations. This deeper layer was left unexplored by the DECCD, who just accepted the view at the time, and still accepts in 2008, that computer technology has 'promised' us a brave new world with increased productivity, improved quality of life, a shorter working week, more leisure time, better health care and "spare-part surgery" to perhaps extend our life expectancy beyond one hundred years.

We are still left with the question not really addressed by the DECCD in their 1997 computer policy, what is education for in these technological times? Is it, as stated by the DECCD, that computers as neutral tools, can just be used to gain skills for the adult workplace. I now ask myself what was the relationship between the DECCD's computer policy and the issues and concerns that I have raised about technopoly and the intent of the DECCD?

What was the DECCD's educational 'purpose'? There is an absence of an appropriate ethical intention in the DECCD's policy documents. Was 'purpose' just about equipping students for 'the future', to become productive members of the workforce? By their very action have the DECCD made clear what they see as the 'purpose' of education, that is, about getting students ready for their working life, for living in an economy, for living in a technopoly? If this was their intention, was there a serious lack of purposefulness in the DECCD's actions?

There was an unsettling political reality at the time for the Tasmanian Government leading up to the computer roll-out in 1997. The 'electorate' would be expecting that our students would be well 'equipped' by schools to enter the future work-force with all the important and necessary computer skills.

Where might I find a deeper layer and glean some understanding of educational purpose not addressed by the DECCD policies? Jerome Bruner (1996) may help me to understand the cultural purposes of education when he suggests that,

> ...education is not simply a technical business of well- managed information processing, nor even simply a matter of applying "learning theories" to the classroom or using the results of subject-centred "achievement testing." It is a complex pursuit of fitting a culture to the needs of its members and of fitting its members and their ways of knowing to the needs of a culture. (1996, p.43)

Bruner asks, should schools aim simply to reproduce the culture, to "assimilate into an existing culture" ...or to prepare students to cope with the "the changing world in which they will be living" and how shall we decide (1996, p.ix). The DECCD argued

that as computer technology is and will be part our changing world, then it is necessary for students to incorporate computers into their daily lives.

Bruner also says that what we resolve to do in school only makes sense when considered in the "broader context of what the society intends to accomplish through its educational investment in the young". How we conceive of education is a "function of how one conceives of the culture and its aims, professed or otherwise". He looks to the question of how education equips individuals to participate in the culture on which "life and livelihood depend". (1996, p.x)

Was the DECCD influenced by what Bruner describes as a view that the mind could be conceived as a "computational device", concerned with information processing: "how finite, coded, unambiguous information about the world is inscribed, sorted, stored, collated, retrieved, and generally managed by a computational device taking information as a given, as something already settled in relation to some pre-existing, rule-bound code that maps onto states of the world, " and about how it might be improved through education. (1996, p.1)

Might this view suggest the unintended consequence that we are in danger of the "submission of all forms of cultural life to the sovereignty of technique and technology" (Postman 1993, p. 52)? See citation on page 37 above.
Postman's Technopoly illustrates what Bruner describes, that we should be able to teach human beings more effectively and efficiently from knowing how to use and program computers, and the view that computers are faster, more orderly, less fitful in remembering, and, do not get bored.

Could it be that the DECCD should have acknowledged in its policy documents that computers do not recognise the boundary between human and non human functioning and therefore our cultural, moral and ethical ways of knowing and being have not been honoured? Bruner reminds us that culturalism "concentrates exclusively on how human beings in cultural communities create and transform meanings" (1996, p.2). These meanings he says, are represented by a "symbolism shared by members of a cultural community [e.g. schools] in which a technical-social way of life is both organized and construed in terms of that symbolism"(1996, p.2)

This symbolic mode is not only shared by members of a community, but is "conserved, elaborated, and passed on to succeeding generations who, by virtue of this transmission, continue to maintain the culture's identity and way of life" (1996, p. 3).

This is how we share meanings as human beings. Thomas Alexander (1993) says that "we are erotic beings. Our *eros*, however, is neither divine nor animal. It is distinctively human: we are beings who seek meaning imaginatively through each other, and the locus of this transformative encounter is the community" (p.203). What might be missing in Technopoly and in the DECCD documents is perhaps this sense of humanity coupled with community, united by *eros*, the passionate search for meaning.

Do we need to listen to Max Van Manen (2000) who makes the point that practices of education "have tended to become overly rationalistic, scientistic, corporatist, managerial, and narrowly results based"? He argues that we need to ask the question of "what it would mean if teachers were treated as moral agents with a practical professional language. A professionally acknowledged moral language would allow teachers to think about their daily practices as essentially pedagogical interactions", (p.1).In distilling the meaning in the DECCD's documents, in this thesis, why does it seem so apparent that that the DECCD did not consider cultural, moral, and ethical purposes when introducing computers into schools?

From within this collaboration, in this search for meaning and understanding, I embrace Postman's loving resistance fighter, to resist Technopoly by refusing to accept "efficiency as the pre-eminent goal of human relations" and, to accept the wisdom of Paulo Freire (2001) who talks about ethics and democracy and the ways in which they may release a "sense of agency in the long explored and cruelly silenced", for those who have no voice in public decision making. He talks about "ideology and freedom in a world marked by a threatening 'globalization' and an unprecedented manipulation by media". (p.19) He speaks of love, passion and caring.

Chapter 4

Invisible Cusp: Looking Back 180 Degrees: Looking Forward 180 Degrees

So far Postman's technological framework works to help me to understand and to critically analyse the DECCD's computer roll out. With his notions of *Theocracy*, the use of tools within the jurisdiction of social or religious systems, which in turn derive from each society's belief system or ideology. *Technocracy* where, over time, scientific discoveries lead to the subversion of the ideology and organisation of society and where the development and use of tools play a central determining role in the 'thought-world' of the culture and in defining human success; and *Technopoly*, where "all forms of cultural life are subjected to the sovereignty of technique and technology" (p.37) —both a state of mind and a state of culture—becoming the chief source of authority, definer of life-goals and provider of satisfaction.

In my search, I am hoping to find a deeper educational purpose than one that only steers toward students attaining works skills and keeping up with new technologies, one that appears to be DECCD's overriding purpose, without expression of any understanding of what Bruner (1996) suggests in understanding the "broader context of what the society intends to accomplish in its investment in the young" (p. x). I search for acknowledgement as to whether there is any consideration of a moral, ethical or cultural understanding of what it means to be human in our society, now, before and beyond investment in economic and technological innovation.

In this chapter I will expand Spady's notion of an 'educational iceberg' which he describes as "drifting in a sea of ingrained habits, past practices and institutional inertia" and whether we might find a 'cusp' that would enable a 180 degree turn to go forward rather than walking backwards into the future. Spady's iceberg, like Postman's technological framework, works for me to deepen the layers of my understanding.

Then I expand the notion of 'promise' of a new era in classrooms as computers began to arrive and the dangers of an unquestioning acceptance of the claimed benefits of these new technologies into our classrooms. Next, I ask "Of what Technologies is man a species" as I discuss what might be the unintended consequences of the DECCD's notion that computers are just 'neutral tools' in the classroom. Later in 'human partners in the classroom', the likely dangers of the DECCD not taking account of our human agency in educational purpose is considered and I ask why the DECCD did not deliberate upon the socio-cultural capacity of computers to neutralise and objectify our human agency?

Now I come to William Spady (1997) to help reflect on whether our understandings as educators are causing us to be walking backwards into the future, facing towards where we have been. I was hopeful that the introduction of computers into Tasmanian schools would be a 'cusp', a turning point that would give us the chance to turn 180 degrees to look and move forward into the brave new world of the future. I have come to the view overtime that, through my own knowledge, experience and understandings as a classroom teacher and through a review of the DECCD's two 1997 documents, and the most recent Tasmanian Government's communiqué to teachers in 2008, *ICT Information and Communication Technologies*, that the computer might not have signalled a cusp in the way I had hoped. What other ways, then, might I suggest that the cusp come into being? How might we come to understand why this hope for a cusp for looking forward does not appear to be happening?

I was attracted to Spady's (1997) notion of an educational iceberg "drifting in a sea of ingrained habits, past practices and institutional inertia" because of his suggestion that "formal education accumulates cultural and historical paradigms" (p.8). So much so, that I have borrowed his metaphor to help me explain my notion of 'cusp'. Spady traces stages in western cultural educational history when certain practices became ingrained. He places the Feudal Age at the bottom of the iceberg. It is an age that constitutes an agenda "of sorting and selecting the most able and deserving students so that high educational opportunities are not wasted on others" (p.10). Next from the bottom is the Agrarian Age calendar, which "limits teaching and learning around the traditional holidays to harvest crops" (p.9). Next up is the Industrial Age

representing a “delivery system” that defines and organises curriculum, teaching, assessment, and student placement around the “major features of the factory assembly-line, with everyone doing pre-assigned work at a pre-scheduled work-station for the proper amount of time” (p.9).

Just below the surface of the water, Spady places the Bureaucratic Age, in which a certain culture “defines and operates everything in the system on the basis of time spent, resources, programs, means, procedures and roles rather than on outcomes, results, standards, achievements, ends and goals accomplished” (p.9). Spady’s criticism is that each of these stages happen without rejecting or adapting previous models in the light of new developments. That means that teachers are unknowingly dragging along nine-tenths of an iceberg and because of this ‘drag’ they are moving ‘forward’ slowly.

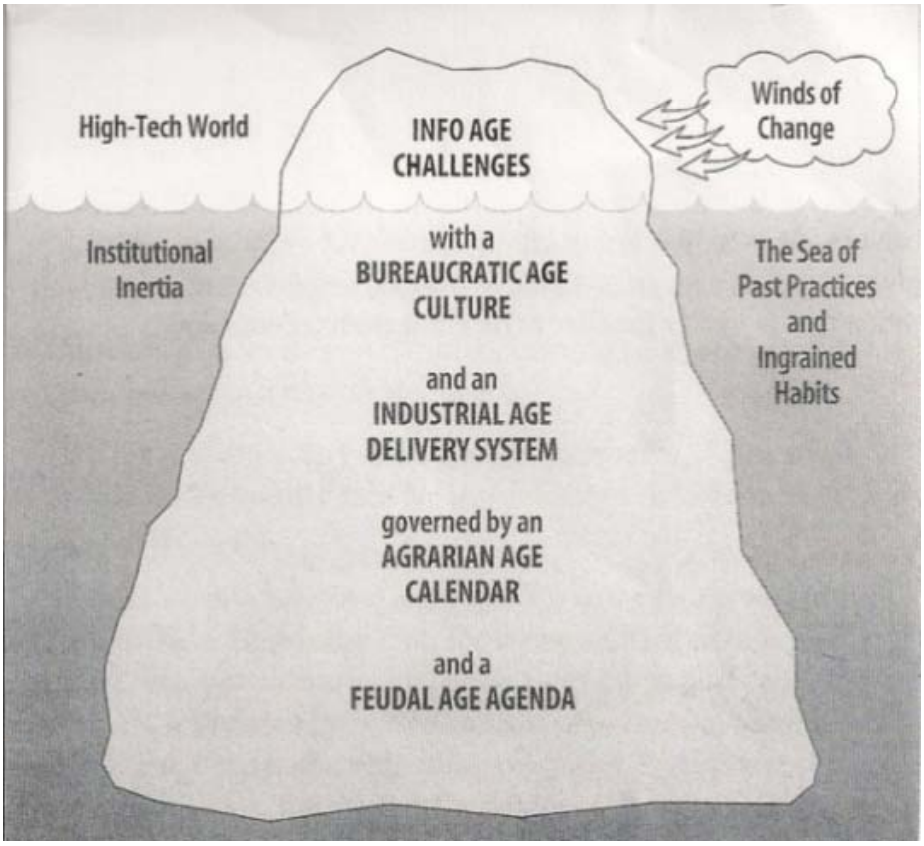

Figure 3: Spady’s Educational Iceberg (1997 p.9)

Blowing across the tip of Spady’s iceberg are the challenging “Winds of Change” of the new Information Age. Above the water, suggests Spady, “educators attempt to respond to the constantly evolving and increasing challenges of today’s information

age blinkered to the rest of the iceberg [which] remains sheltered from and largely uninfluenced by ...future conditions and realities" (1997, p.9). He asks, for instance, if computers allow for tailored learning programmes and individual progression, why students are still arranged in age-based classes. Is it that we have continually dragged the nine-tenths of the iceberg and that the cusp did not eventuate because schools are accountable not to their students but to the parents who 'value' a previous experience? Or is it that the often claimed flexibility of computers to allow students to learn anywhere at any time, does not allow for the need for students to be supervised in a 'learning relationship'? Has the drag of the iceberg, perhaps the dangers it represents, made the possibilities for recognising cusps —signals or turning points for going forward— invisible?

It could well be that educators are dragging nine-tenths of the iceberg because they are not fully embracing computers in manners that will allow for change. Or it could be for the reason that I argue in my thesis that the very nature of computers does not allow for change to occur. Nine-tenths of an 'iceberg' will always be below the surface so it is the composition of the nine-tenths that is important. Is it the synergy of the Information Age that gives a cusp the energy that it needs to make its turn?

Thus I show how we have moved from a stage where our ideologies and social systems determined the use of tools, to a stage today where technologies significantly influence our social systems, as well as our perceptions of what and who we are. There is much of value in our educational traditions and social systems. There is also the promise in the contribution of technology to education into the future. I believe that we must consider how to blend aspects of both, to bring about the synergy that will take us beyond the cusp and into the future, looking ahead rather than backwards.

The Promise

From the arrival of one BBC micro-computer in my classroom in 1984, through to my 'Computer Immersion' trial in 1994, I felt ready and confident to enthusiastically embrace the 'winds of change' opportunity as part of the DECCD's computer roll-out into my school in 1999. The promise to teachers, as I came to interpret and

understand, was that the computer should be seen as an intellectual laboratory and a vehicle for self-expression, an integral part of the learning process. In the context of policy statements, literature reviews and professional development sessions, we were led to understand that a competent computer-using teacher would not be one who could recite a reference manual, but one who could make a body of content interesting, meeting the interests and experiences of our students, as well as improving their literacy and numeracy.

Our teacher's role was to recognise when it might be appropriate to involve the computer in learning, allowing students to use computers as a personal expression of the subject matter. In addition, it was suggested that the increased sophistication and availability of computers in schools would enable teaching to be based more on the individual, rather than groups, as students and teachers became more adept at using computers to undertake independent projects. We were to understand, if not told, that teaching and assessment practices which encouraged the integration of computers as a tool in the development of new learning processes, would be very effective in some curriculum initiatives, as computer-based assessment became more common, especially in relation to special needs students (less able students requiring additional instruction). This enthusiasm was shared by my teacher colleague Sarah,

> I quickly became an enthusiastic user as we were told computers would engage and motivate our students. With computers in our classrooms, we were told; we had access to a wide range of resources that would improve our teaching skills and would also provide unlimited opportunities for our students to improve their learning. (Jordan, 2002, Working Paper 1, p.1)

I supported claims by government and expectations of parents and the business community that were becoming apparent to me as I strained to understand them, that the skills and understandings needed by students in the computer age were vital to our futures. The claimed skill benefits ranged from the practicalities of using computers as a means of conveying and retrieving information, to helping to facilitate the development of higher order competencies such as research, communication and problem solving. The ongoing technological developments in

miniaturisation, electronic communications, and multimedia were making many forms of necessary media available through computer access including the Internet. The need to develop good pedagogical models both to realise the potential of computers and to integrate them in a purposeful way into an overall learning program was crucial. With increasing levels of computer use in schools, we were to understand that sound pedagogy was a perpetual priority.

As my study of the DECCD's literature review has emphasised, there was also a tendency for advocates to provide futuristic rhetoric that was not always well grounded, making inflated claims about the potential benefits to schools and society generally that were unsubstantiated in early research. There was recognition that the effect that computers might have on learning was not automatic and that the issue was a great deal more complex than was at first supposed. So why would the Tasmanian Government come to accept such an 'act of faith' – expressed in a roll-out of hundreds of computers to schools state-wide? This is a question that I cannot resist asking. Perhaps the only answer to this question is another question, the one that accompanies a shrug of the shoulders, 'who knows'?

The DECCD documents make it clear that a critical factor in improving literacy and numeracy is the way that teachers incorporate computers into teaching programs. These factors include the way the technology is used, the purpose for using technology, the learners' goals, the educational content and instructional paradigms, the teacher, the students, the length of study, the classroom and school context, and the stage of implementation. But is not this the case with all curriculum initiatives? Has there never been meaningful learning in classrooms? Where *is* evidence that improved student learning is achieved simply by using computers?

Computers were delivered into our classrooms whether we liked it or not. The government, the school and the system expected us to make the necessary changes, physically, as well as philosophically and educationally, to our classroom environments. They expected a remodelling of classrooms often over-flowing into corridors or cupboards to make enough room for computers. I can still see the boxes of computers piled up in the foyer, the technicians scurrying about unpacking boxes,

cables, moving desks, chairs, and cupboards while we stood back and awaited the installation, excited as we were.

I wonder whether we made changes to our educational environments which were irreversible, difficult, and expensive to adapt or change to future educational needs. An example is new buildings which were custom-built for technology, with small group and individual work-stations instead of larger whole class spaces. Was this to herald reduced spending on the redevelopment of school buildings, less access to 'older technologies', including less spending on books, libraries, physical education and music learning opportunities? To what extent would implementation have been more effective if teachers were allowed to choose suitable technology according to their needs and understanding?

With the arrival of computers into our classrooms, the presence of the 'virtual instructor' challenged the ways in which we as teachers must interact with our students. Like all-important technologies of the past, film, radio and television as examples, the presence of computers in the classroom may have had unintended consequences both positive and negative, sometimes in equal measure, sometimes more in one way than the other. On the other hand, computers could be the solution to perceived educational short-comings and societal divisions, as the DECCD and its proponents often claimed. They could highlight the disadvantages of some groups and exacerbate the lack of social opportunities in terms of work, class, race and gender.

At the risk of such unintended consequences, the DECCD expected teachers to use computers in the classroom to 'raise standards', without deeply questioning the assumptions or the methods to be used. I sense strongly that Postman, Winner, Apple and Beyer and others of similar mind would support my growing belief that, when a government or education authority uses computers as the 'solution' for perceived inadequacies in literacy and numeracy standards or as a way of occupying students who have behaviour issues or learning difficulties, it is blind to the direct consequences of permitting technological tools to dominate the life of communities—in this case, schools— with the possibility that through setting up

dangerous relationships between humans and technologies; technologies could define what it means to be human.

To what extent will the presence of expensive equipment in the classroom exert a pressure to use computers, even when there is no particular benefit? Will mathematics and science experiments be written up on the computer simply because it is there? What happens to those less skilled on computer use? What is the relative importance of reading, number or computer literacy? What constitutes the minimum acceptable level of 'computer literacy' however it is defined, and what steps should schools take to ensure that all their students achieve this? If it is assumed that most of students' work is done on, or with the assistance of the computer, what are the implications for access at school and at home? My colleague teacher Sarah expressed a similar frustration,

> To give every child a turn on the computer each week was difficult because their written activity in particular, took a long time, or because I needed the whole class to attend to something else. Some students were reluctant to take their turn. My time was often taken away from teaching to managing the computers, especially with younger students, helping to set up and save their work as they would get confused, spending time changing the formatting, or changing other settings but not necessarily saving their document. I wondered whether these problems will diminish as more students have access to computers at home. (Jordan, 2002, Working Paper 1, p.3)

The DECCD documents claim that computers transform what children learn and how they learn, and that classrooms become a workplace where students engage in meaningful, product-oriented activities that focus on authentic issues and opportunities. They acknowledge that success or otherwise depend on the teacher and the way she uses the technology and encourages students to use it.

The introduction of the BBC model B microcomputer into classrooms in the early 1980s was based in part on the ideas of Seymour Papert (1980) in *Mindstorms: Children, Computing and Powerful Ideas*. Papert had a huge influence on early

classroom computer use with his creation of his computer programming software, LOGO. He incorporates Piaget's child development theories [1] on the basis that the models or tools a child is given will ultimately shape how and what the child can learn. Papert's emphasis on the necessity to understand the technical functions of computers and the nature of technical reasoning, has directly contributed to dominant views of what it means to be educated. Papert bases his approach to learning on the way in which a child learns to speak. He states that,

> …speech is part of the child's natural landscape, and children learn to talk 'naturally' as they communicate with their parents and other family members. Make computers a part of the child's natural environment and the child will seize the opportunities they offer to explore and learn. (Cited in Armstrong & Casement, 2000, p.40)

Papert believes that spontaneous learning makes much formal education unnecessary. His views were very influential in Tasmanian classrooms when the BBC micro-computer was introduced in 1994. Students were expected to program both the on-screen and robot turtle. They knew that if they entered certain numbers then a pattern would appear on the computer screen or the turtle robot would move on the floor. LOGO™ disappeared with the roll-out of computers post-1997.

Restricting student learning opportunities to those activities that they could readily carry out on the computer was potentially limiting the learning practices of students. I believed and I always tried to be mindful that computers could not do the higher order thinking tasks that Papert claims for them, such as helping students to analyse or interpret. I wondered how well-equipped, competent and committed teachers and students have to be to enable the entire class to use computers as a 'tool' of their learning landscape, to stimulate higher order thinking. To what extent have teachers and students adopted the belief that computers were superior to humans in classrooms without examining the consequences of such beliefs? This might explain

[1] Piaget (1896-1980) proposed that children's thinking does not develop entirely smoothly: instead, there are certain points at which it "takes off" and moves into completely new areas and capabilities. He saw these transitions as taking place at about 18 months, 7 years and 11 or 12 years. This has been taken to mean that before these ages children are not capable (no matter how bright) of understanding things in certain ways, and this meaning has been used as the basis for developing school curricula.

why some teachers in my school viewed the computer with suspicion, as just one more ‘mandated fad’ or as a threat to their professionalism.

Though there was an uncertainty among my colleagues about exactly what the role of computers in the curriculum was, there was a general feeling that computers were a significant addition to our classrooms, computers would be an important feature of education in the future and educators must play an active role in the way they are incorporated into the learning environments of classrooms. Based on evidence from literature searches, the Tasmanian Government introduced computers into classrooms to improve student learning. This decision required taking considerable social and political risks as the educational futures of our students were at stake. The future may reveal that students’ time spent on computers did not achieve the learning outcomes that education systems desired. Today it is very difficult, if not impossible, for governments to retreat from the political, financial and societal commitment of computers into classrooms, made a decade ago. We often need to rationalise our original decisions rather than accept that we might have made a mistake. By redirecting our human and financial resources, away from reducing class sizes, or focussing on appointing extra adults, such as teacher assistants, to work with students on literacy and numeracy in favour of purchasing computers, are we now faced with unintended consequences?

Many of the most important examples of technologies that have political and social consequences such as we have seen in the stirrup, the Moses bridge design, the rifle and computers, are those that go beyond the ‘intended’ and become the ‘unintended’. This may mean that a particular direction or decision that produces results, considered to be positive or seen as a wonderful breakthrough by interested parties at the time, may be seen as a crushing setback by others. It is not possible to make generalisations about the impact of computers in classrooms *per se* on student attitudes and achievement because there are so many other factors at play, including changes in the curriculum as well as social and political influences. Pointing out the complexity of factors in systems and relationships Rowe says,

> ...understanding the impact of computers in classrooms means understanding the complex system of interactive relationships

> between people, situations, tasks, social and cultural processes and the learning context of which the computer is an integral part.

And also,

> Computing in the classroom cannot be disentangled from the cognitive, social and personal demands of the curriculum goals and instructional tasks which teachers set for their students, or from the interests, motivation, skills, knowledge, abilities and difficulties which students bring to the learning situation. Understanding the impact of computers in education means understanding this complex dynamic system of variables as a whole. (Rowe, cited in (DECCD, 1997b, p. 11)

It is important to ask, what we should assess in order to determine whether we have been successful or not with computers in classrooms. We need to know what it is that we intend to achieve. The DECCD documents stress the importance of being 'computer literate' but definitions of computer literacy differ as Armstrong and Casement explain,

> Along with the changes in the way computers are used, we have seen a continual shift in the meaning of computer literacy. Interpretation has ranged from loading a disk to proficiency in various applications to email and Internet, with no consensus as to what computer literacy entails. (2000, p. 6)

As teachers we were required to report to parents indicating our students' understanding of 'computer literacy' using a checklist of isolated skills. This was always a difficult thing to do as definitions of what constituted the minimum acceptable level varied. The more important question was whether such reporting was relevant and, if so, what steps schools should take to ensure that all their students achieved an acceptable level. Did the argument for computer literacy prioritise the technology itself and student access, rather than its educational purpose?

At the time of writing, we are probably still trying to understand the relative importance of literacy, numeracy and computer literacy. What will happen to

'computer illiterates', when and where computers use is commonly equated with high intelligence? Does the ability to use computers, in fact, mean future success? Does computerizing an activity automatically improve it? This line of questioning requires a meaning for 'computer literate'. It requires consideration of what might have become 'unintended outcomes'.

Papert (1980) suggests that "true computer literacy" is not only knowing *how* but also *when it is appropriate* to use computers and computational ideas. Knowing how and when it was relevant or appropriate to give computer access to students was always an important consideration for me as their teacher. One of Papert's arguments for the early introduction of computers to students is his claim that this technology would "sharpen children's minds and accelerate their intellectual development" (cited in Armstrong & Casement, 2000, p. 38). Papert also believes that computers accelerated the process of cognitive development, by shifting the boundary between Piaget's concrete and formal operation stages and allowing children to make the transition to adult thinking at a much earlier age than was previously considered possible. He suggests,

> This faster, smarter philosophy lies at the heart of computer-based learning. Its aim is to catapult children into the adult word as quickly as possible. Through the wonders of computer technology, young minds will be able to leapfrog over the tedious obstacles of childhood learning to become full members of the cyber culture their elders are so eagerly embracing...the computer is very much part of an adult agenda. (Cited in Armstrong & Casement, 2000, p.40)

This is a scary, frightening image of a child's 'new world'. Would Papert have us deliberately, without much thought of nourishing or preserving the delights of childhood, catapult our children into Postman's Technopoly, into such an adult cyber world where we would be more likely to assume that students have learned, become literate because they are using computers? I was always troubled by Papert's view that intelligence is a kind of 'technical mimicry' in which the brain works

synchronically with the step by step procedures of a machine, while human memory becomes just another data bank (Postman,1993, p.38).

At first, it appeared that the DECCD agreed with Papert as it cites in the review a number of sources which support Papert's claim that students' "engagement in computer programming enhanced their cognitive development" (Liao & Bright, 1991; Clements & Battista, 1990; Johnson-Gentile et al., 1994). Interestingly, the only example given is of Papert's LOGO™ programming language and robot turtle which, as mentioned earlier, were superseded as part of the 1997 computer roll-out which accompanied the circulation of the document *Computers as Tools for Teaching and Learning* to schools and teachers. Programming in the DECCD's view, it seemed, was no longer part of the primary students' computer experience, as programming software and expertise were not included in the expectation for teaching and learning with computers as tools. This omission was either deliberate as the view could not be sustained by the DECCD, or it was better left with an ambivalent status for anyone to attempt to comprehend. What view of teaching and learning using computers as tools were teachers to comprehend?

In Computers as Tools for Teaching and Learning, the DECCD list a range of outcomes, the achievement of which, it claims, can be demonstrated by "observable student behaviours", for example, the outcome "use of computers for a range of purposes"

> …can be observed when students ... locate, retrieve, store, organise, interpret, analyse, synthesise and evaluate ideas and information using computers. (DECCD, 1997a, p. 4)

I found that these behaviours did not *necessarily* demonstrate achievement of the intended outcomes. Students could be observed to, locate, retrieve and store information using a computer. I tried to make my students aware of the distinction between what machines do when they process information and what human minds do when they think.

The central point made by the DECCD is that computers are important to teaching and learning and they cite Brian Algar's experience at River Oaks School in Canada. Algar argues that computers "*enable*" students to access, extend, transform and share ideas and information, "key processes by which students learn ... [and] express their creativity and imagination" (DECCD, 1997a, p. 1). This claim reflects a conflation of skills that arise from the use of ICT by humans, with human thinking capabilities.

There is no doubt that computers have facilitated access to ideas and information that it is electronically stored. Electronic information is easier to update, cheaper to disseminate and instantly available to a world-wide audience. As a result, public and commercial agencies are replacing their printed publications with electronic versions— maybe a risky undertaking given how rapidly storage technology in particular is changing.

My experience with primary age students showed that the existence of information online or in print did not in itself guarantee that it was reliable, valid or authentic or that students have the capacity or maturity to understand it. In recent times, various forms of self-publishing such as Wikipedia, social networking sites and blogs are burgeoning. Students can search out multiple sources to see whether they support their argument, but they also need to question the reputability, purpose and potential bias of each author and evaluate the evidence available to support any claims. Computers also facilitate the extraction and reproduction of attractive information. It is easy to produce a 'cut and pasted' assignment in multimedia forms without necessarily having understood the content.

The DECCD's promotion of computers as tools, raises a number of other problems to consider.

> Computers are tools that ... enable students to...extend ideas and information through processing, manipulating, analysing and publishing material in different multimedia forms. (DECCD, 1997a, p. 1)

There are different types of processing and manipulation. According to the DECCD, by presenting data in different formats, computers can help students with different learning styles to 'see' in different ways. Examples include presentation of data in tables, charts and graphs and representations of solids in three dimensions and from different perspectives. Does the compilation of a table, graph, pie chart or histogram, constitute an analysis according to the DECCD? The distinction between what machines do when they process information and what minds do when they think, must be kept clearly in view by teachers and students alike, and as Roszak says the "line that divides mind from the machine is being blurred." "Processing, manipulating and analysing," could also be interpreted to involve "interpretation, synthesis and evaluation" (1994, p. xv). Whilst the computer can sort, order and present information in a variety of formats, 'organising' assumes the existence of specific criteria and that information will be fed into specific fields according to whether it meets the relevant criteria. It is the student who carries out this activity. For the computer to be able to interpret, analyse, synthesise and evaluate information, it is the student who must specify and apply criteria such as relevance, reliability or validity.

It must be obvious, indeed inevitable, that in Tasmania, where society is predominately Anglo-Saxon, our selection and use of computers in classrooms represents a western cultural world view which it turn serves to reinforce that particular world view. Our experience with a technology can strengthen certain attitudes whilst it cloaks the possibility of alternative ways of thinking. Writing in 2000, Bowers makes a strong point when he says that we should be aware of how the computer carries cultural assumptions. For Bowers, the attitudes that are reinforced by computer technology are those of western industrial culture and, as such, have grave implications for our western culture. Bower's point is that computers reinforce ways of thinking that favour,

> ...explicit and decontextualised knowledge (data, information, and models, with no clear authorship); subjective judgement and individual autonomy; language as a conduit of sender-receiver communication; subjective experience of temporality, where the value of cultural traditions and responsibilities to future

> generations is individually determined; instrumental and subjective morality; and human-nature relationships dominated by anthropocentrism. (2000, p. 158)

As evidence of the claim that computers perpetuate these cultural attitudes, Bowers (2000) points to the writings on technology and science of Francis Crick (1994), Howard Rheingold (1991), Michael Benedikt (1992), Sherry Turkle (1996) and Nicholas Negroponte (1995). These writers collectively assert, says Bowers, that "information technology is inherently linear and mechanistic and reflects a western industrial world view which values efficiency, without apparent concern for the individuals involved and the environment" (2000, p.158). Could our western industrial ideology be a legacy of Spady's educational iceberg? Computers in schools became part of the nine-tenths of the iceberg and so, part of the 'drag', instead of being there at the 'tip' blown by the 'winds of change', as was Spady's hope. What is it about our western ideology that does this, that submerges computers in schools below the surface of a sea of past practices and ingrained traditions and institutional inertia as it is 'dragged along' by dominant western technological traditions.

The western views that Bowers and others ascribe to information technologies, also illustrate Postman's culture of Technopoly where the battle for dominance wins, particularly in our schools where such views have become a very important determinant of our school curriculum, purpose and meaning and of our ways of knowing and thinking or of not thinking. It is part of our western cultural mindset that our tools are not only 'using' us, human beings, but are defining what and who we are.

There is a danger that many of us might see computers as 'autonomous', having a 'life of their own', independent of "social intentions, power, and privilege." Many of us view most technologies as constantly improving and changing our lives for the better, both in schools as well as the wider community. By focussing on what is changing and being changed, we may not notice that educational, cultural and economic inequalities continue to dominate our schools and wider society. Winner (1986) suggests that it is imperative that a society try to guide its

> ...socio-technical development according to self-conscious, critically evaluated standards of form and limits as technological innovation is inextricably linked to processes of social reconstruction; any society that hopes to control its own structural evolution must confront each significant set of technological possibilities with scrupulous care. (p. 169)

The introduction of computers in Tasmanian schools was based on an assurance that they were necessary to improve student learning and consequently their future employment opportunities. On a principle of access, schools received one computer for every five students, and the educational system assumed that students would have equal access opportunities for using computers. The educational system did not consider, it seems, that student confidence, competence and perceived relevance had to be won. As teachers were we guilty of Winners' (1986) "technological somnambulism" by not considering carefully what some of the unintended consequences might be? As one teacher, I was aware of some of these issues. Following my 'Computer Immersion' trial in 1994, I had reported that

> Differences in perception, access and levels of confidence affect the extent to, and the way in which, different students use computers. If 'computer immersion' legitimises and formalises the computer as the prime vehicle of learning, we need to find ways to minimise the discrepancy between those pupils who have access to home computers and the rest. By gradually, possibly unconsciously, basing their class work and homework demands on performance of the former, teachers will place unacceptable pressure on those students who only have access to computers at school and who are always 'catching up' and are unable to achieve the satisfaction and praise available to the advantaged group. Some compensation may be achieved by timetabling different degrees of access to computers, but this may be seen as 'unfair' and undermine the classroom ethos. Moreover, unless schools are able to update equipment and software on a regular basis, the growing discrepancy between home and school equipment will create incompatibilities and disaffection on the part of some students. Whilst recognising that there are individual differences

> between students in any given class, how does the teacher manage the psychological/motivational consequences of such a twin track? (Jordan, 1997, p.3)

We may well continue to question and despair of the principle of equal access. In 2008, teachers in my study have reported to me that the ratio of one computer to five students has not changed, software is not up-to-date, and still, not every student has a computer at home, nor is every student literate or socially competent.

Unquestioning Acceptance

We adapt ourselves to the demands of technology. Winner (1986) maintains that technological developments were absorbed into the "ever mutating process of human activity" so that they came to be taken for granted and were integrated into our view of what is natural or inherent in the world. They become "second nature", as Wittgenstein terms it according to Winner; they become part of our "forms of life" (p. 11). The influence that the notion 'progress' has exercised on social thought since the Industrial Age and the dangers of our society's unquestioning faith in technology has continued.. Weizenbaum (1976) suggests that it is,

> ...paradoxical that just when in the deepest sense humans have ceased to believe in, let alone trust, their own autonomy, they have begun to rely on autonomous machines that, is, on machines that operate for long periods of time entirely on the basis of their own internal realities. (p.10)

If our reliance on such machines was based on something other than unmitigated despair or an act of faith, we must explain to ourselves what these machines did and even how they did what they did. This required us to build some conception of their "internal realities". Weizenbaum (1976) suggests that most people did not understand computers to even the slightest degree. We could only explain to students the computer's "intellectual feats" by bringing to bear the single analogy available, that is, our model of our own capacity to think (Weizenbaum, 1976, p. 10). Winner (1996) makes a crucial point when he says that technologies were not merely aids to

human activity; they were also powerful forces acting to reshape that activity and its meaning.

It is here that we must take the "scrupulous care" that Winner (1986) advocates. This is not to take for granted that all new technology is good and society should guide its "socio-technical development according to self-conscious, critically evaluated standards of form and limits" (p.29). Rather it is to return to Postman's (1993) question about what learning is for and not how, but why we should proceed. With scrupulous care we must confront, examine and justify every technological possibility.

Winner's (1996) main focus is on the way we *think* about technology. He maintains that, unlike other forms of human creativity, technology has never been considered a subject worthy of philosophical inquiry. Our general approach to technology is more concerned with "how things work" and "making things work", than with the "moral and political significance of technical systems in themselves" (p.61). If we are to awaken from our "technological somnambulism, a condition in which progress is driven by technology itself rather than by the vision and innovation of society at large," then we need a new approach, "a philosophy of technology" that examines the consequences and wider implications of technology in our lives (Winner, 1986, p. 4).

We tend to think that this is the responsibility of certain people in certain occupations, but not for anyone else.

> How things work is the domain of inventors, technicians, engineers, repairmen, and the like who prepare artificial aids to human activity. Those involved in the various spheres of 'making' are thought to have little interest in or need to know about materials, principles, or procedures found in those spheres. (Winner, 1986, p. 5)

We could resist Winner's (1986) notion of technological somnambulism and not slide into it by becoming like Postman's "loving resistance fighter (s)" and retaining

our “narratives and symbols”. Schools, Postman argues, should be the “principal instrument for correcting mistakes and addressing problems.” Thus, education is to lead the resistance against Technopoly. By taking as its central theme “the ascent of humanity,” the curriculum, Postman asserts, will help to restore a sense of meaning and purpose lost to Technopoly. In this curriculum, all subjects are presented as a “stage in humanity’s historical development in which the philosophies of science, history, language, technology, and religion are taught” (Postman, 1993, pp.182-198).

A resistance fighter, asserts Postman, understands that technology must never be accepted as the natural order of things, that every technology,

> ...is a product of a particular economic and political context and carries with it a program, an agenda, and a philosophy that may or may not be life enhancing and that requires scrutiny, criticism and control. In short a technological resistance fighter maintains an epistemological and psychic distance from any technology, so that it always appears somewhat strange, never inevitable, never natural. (1993, p.185)

It is very important that society tries to guide its socio-technical development according to “self-conscious, critically evaluated understandings” (Postman, 1993, p.185).

Weizenbaum (1976) criticises the ‘scientific community’ for blindly pursuing “the nebulous path of technological progress” and demands that the community consider “ethical and moral issues associated with the development of machines that can imitate human behaviour” (p. 11). It is not what computers will be able to do but what we should allow them to do.

Later Bowers (2000) complains that the discussion of computers in schools had become too narrow; he specifically cites the lack of discussion about cultural and environmental issues and suggests that what was needed was an interpretation of the

ways, both obvious and subtle, in which every day life was “transformed by the mediating role of technical devices” (p. 20).

Was the large-scale computerisation of primary school classrooms to displace more rewarding educational experiences? If so, we would have every right to question whether computers have a role in primary classrooms at all. If they have a role, should computers compete with the focus on nurturing students, connecting them with other people in a social setting and giving them the opportunity to experience real hands-on objects? Is there a possibility that computers would not be used in primary schools? Could society ever consider that?

When computers are introduced into secondary schools should this not be in a way that assures that students understand how computers work, examine the appropriate place of technology in their lives and become instilled with the idea of ethical behaviour especially on the Internet? Should secondary school students learn the basics of how computers operate, learning the history of technology and how it has shaped society? Might it not be considered ironical that, in preparing students for a high-tech future, we must focus our attention more than ever before on the task of understanding what it means to be human, to be alive, to be part of both social and biological communities, a quest for which technology is increasingly becoming not the solution, but the problem?

The DECCD, in its 1997 roll-out, provided computers and networking infrastructures while schools had to meet the cost of user support, network maintenance and software upgrading. The subsequent reduction of funding, over time, by governments for computers has meant that schools have been forced to redirect their funding from other school resources, such as libraries, visual and performing arts programs, physical education programs, and extra teacher time for students with special needs in order to support their computer initiative. The balance between equity, inequality and quantity will always favour those most able to afford their own computers; the variation between school systems and individuals appears an almost insuperable problem. Some students do not have access to computers at home. Others use later, more up-to-date technology at home than they use at school. Such inequalities persist in 2008.

As an adult, my writing 'mindset' is enhanced when I use a pen for writing. It might be that we are limiting the potential of some of our students by denying them the opportunity to use a variety of materials, for the sake of presentation, efficiency or speed. As mentioned earlier, I noticed during my 'Computer Immersion' trial in 1994, that most of the girls in particular, preferred using pencils and paper for their creative endeavours rather than computer clip art. This "kinaesthetic connection" is what Bowers (2000) means when he says that students are highly motivated when they *feel* "an emotional and physical connection" to what they do (p. 54).

Another 'emotional connector' for me has traditionally been books or print. Armstrong and Casement (2000) support this, saying that computer use "changes perceptions in a radically different way" from print. Print allows time for reflection and a careful consideration of various points of view, but we have come to see computer-based text as requiring immediate action. "Words and images on-screen invite constant change or substitution. Speed and control are emphasised at the expense of thoughtfulness and understanding" (Armstrong & Casement, 2000, p. 11).

The ACOT project cited by the DECCD finds that students spend less time on the 'standard curriculum' and more on developing technology related skills. Although many of my students were familiar with computer applications, they were hampered by a lack of keyboarding skills. I tried voice activation software but discovered that was not feasible because, in addition to the software and very large memory storage, it required a separate voice record for each user, a relatively quiet environment and users able to dictate relatively well formulated thoughts.

The DECCD claim that research confirmed the potentially positive effect of information technology on general achievement, depending on the type of technology and how it is incorporated into the teaching program (DECCD, 1997b, p. 17). Crowne, writing in 2008, agrees with the 1997 DECCD view.

> Evidence shows that where technology is used effectively in schools, the results are inspiring, improved grades and retention

> rates, greater participation by students and increased effectiveness by teachers and tutors. (Crowne, 2008, p. 2)

For technology to be effective in these ways, it must be very important that any model of staff development, and certainly for introducing of computers into classrooms, puts the teacher and learner at the centre of the learning experience, providing a meaningful context for learning. We teachers need practical instruction as well as the opportunity for educational and philosophical discourse that engage and encourage us to reflect on the benefits and limitations of teaching with technology. We need to engage with others in ongoing reflection about what we learn about the instructional use of technology, so that we are more likely to critically evaluate our own pedagogical practice and redesign our approach.

In leading up to this chapter I have shown how I came to believe that, on the basis of my experience, and I believe that, in contrast to the DECCD's intention, computer-based technologies have become detached from student learning in four ways. I have shown that the DECCD documents do not make a distinction between information technology outcomes and general educational outcomes; therefore ICT outcomes were the ends not the means. I have questioned whether students can achieve some of the outcomes that the DECCD acclaim. I have explained my apprehension that to focus on 'processing' to teach lower order skills, such as data manipulation, accessing, ordering and disseminating in different formats, rather than focussing on teaching higher order skills, such as analysing and evaluating could dangerously limit students' learning and not extend, transform and share, to which the DECCD aspired.

I have worried about and lamented the loss of something deeply human in our capacity and ability to connect with one another. Kinaesthetic experiences such as writing and drawing to illustrate practical science and life could become lost opportunities for students to develop their creativity for living. I ask: Does 'two to a computer' constitute group work? How does this differ from students discussing a written text? I acknowledge that these two questions are basic but I hope to have shown that not only are they serious and evocative questions that challenge the DECCD's optimism of 1997 and 2008 about the potential of computers in

classrooms, but they are questions which ought to lead to deliberation about and revelation of the intended consequences of the government decision of 1997, affirmed in 2008.

Of What Technological Genus is Man a Species?

The DECCD might have intended computers to be ‘just tools’ in the classroom but its implementation has made computers much more than that. As I have reflected in writing my thesis, computers, like other ‘tools’, are not neutral in their effect upon the people who use them — tools create their own conditions for their use. Computers are extremely powerful, adaptable tools that can affect a wide range of human activities. In society as a whole, the willingness to embrace computer technology in schools has consequences that extend well beyond the mere fact of their use.

Beyer & Apple (1998) hold the view that computers are not just another “neutral delivery system” but environments in which certain “values, biases, and characteristics” are played out. For example, “calculation and logical operations” are central within a computer-based environment. Beyer and Apple suggest that we need to examine the way computers are used in schools and the implications of this for future education (1998, p. 248).

We must challenge Algar’s (ACOT) assertion that computers are “just there and transparent” “tools” that can be used in “good and bad” ways, which ignores what is happening intellectually, socially, emotionally, morally and politically. I was uncomfortable with Algar’s assertion as I worked with my students in the classroom. For example, I supported Beyer and Apple’s (1998) description of drill and practice software, a practice widely used in schools. This software, Beyer and Apple assert, is designed to produce predictable learning performance, which view the learner as a “generic information processor embodying a deterministic, behavioural technology that turns learning into a systematically designed and controlled form of work.” The full range of “personal intellectual agency”, and computer programming and simulations “delegitimise non-technological ways of learning and thinking about problems.” The tutorial courseware programs, recommended by the DEECD,

encourage “means-end rationality” in the learning process (Beyer & Apple, 1998, p. 301-308). Computers tend, I believe, using Beyer and Apple’s words,

> ... to legitimise rule governed order, objective systematicity, explicit clarity, no ambiguity, no redundancy, internal consistency, non contradiction (i.e., logic of the excluded middle), and quantitative aspects. They also tend to legitimise deduction and induction as the only acceptable epistemological methods. (p. 303)

My classroom conversations with students were often about the computer ‘thinking’ or ‘working’. I found myself falling into the trap—my students and I were using mechanistic metaphors to describe what the computer was doing. In this trap we were reinforcing the Technopolist’s belief that we are at our best when acting like machines, and that in significant ways machines may be trusted to act as our surrogates. I was ‘sucked in’. I came to realise that to remain in this trap would be to contribute to a loss of confidence in our human judgement, much to my dismay.

Rosak’s (1994) concern is that there is a temptation for humans to associate the ability to store data on a computer with the human memory and because a computer program follows logical procedures, this fairly corresponds to what we call reasoning in human beings. Because computers do not look like ‘working’ machines when they are operating, they are seen as working as “smoothly and silently as the brain does when it remembers and reasons and thinks” (Roszak, 1994, p. xv).

I was, and still am, concerned about the way in which having computers in the classroom could prevent students from engaging in other ways of knowing and understanding. Rather than helping students to “critically interpret and evaluate,” a claim that the DECCD espouse, the computer may have been, and still may be, delegitimising some very important characteristics evident when acquiring knowledge, which Beyer & Apple (1998) attribute to epistemological methods: “deduction, interpretation, intuition, introspection, and dialectical synthesis of multiple and contradictory realities” (p. 303).

As early as 1976, Weizenbaum wisely declares that there are differences between human beings and machines, that there are experiences that human beings can have but machines cannot, and therefore, at least, there is a difference between man and machine. Weizenbaum (1976) rejects the idea that human intelligence can be formulated by machine-responsive equations and rules no matter how they may be disguised by technical jargon.

The popularity of the IQ test is one example that still illustrates this view of human intelligence. Tasmanian schools still conduct the IQ test in various forms, often on-line. The idea that human intelligence is measurable or whether it is developed in a linear and rational way is, as I have shown, a contested notion. It is unlikely that computers will ever be able to imitate the wisdom and emotion displayed by human beings.

I agree with Larry Cuban's (2001) view that those who advocate the use of computers in classrooms need to "examine their assumptions" about their potential effect carefully. Advocates of computers in classrooms have seldom taken seriously teachers "classroom experiences, expertise, or the constrained choices that teachers face." Cuban suggests that promoters of computers both inside and outside of schools, who blame teachers' "limited and infrequent use of computers" as "resistance to change or technophobia," ought to examine their own implicit beliefs about technology (Cuban, 2001, p. 188).

Does linking standards-based curriculum, test scores, and accountability to increasing economic productivity and efficiency make learning more efficient and more interesting? To answer yes is "considered entirely inadequate", according to Postman (1993).

> ...since in a technopoly efficiency and interest need no justification. It is, therefore, usually not noticed that this answer does not address the question 'What is learning for?' 'Efficiency and interest' is a technical answer, an answer about means, not ends; and it offers no pathway to a consideration of educational philosophy. It blocks the way to such a consideration by beginning

> with the question of how we should proceed rather than with the question of why. (p.41)

Human Partners in the Classroom

Next, I wish to consider another particularly complex aspect of computers in classrooms. Winner (1986) is not cited in the DECCD's 1997 document. Winner says that the availability of ever more powerful technologies contributes to the creation of a "religion of progress" which encourages us to drift into "technological somnambulism", whereby we adopt each new technology "without adequate consideration of what possible harm they may cause or of any qualities which might be lost" (1986, pp. 169-172). For me, this is about our 'sleep-walking' into the future.

One of the claims the DECCD makes in favour of computers in classrooms is the scope computers offer for individualised and independent learning. For much of the time before computers, my students were engaged in an individual activity or on a common activity, working individually or in groups. Less frequently, I offered them activities to be completed in their preferred order, within an extended period of time. The introduction of computers changed this as I only had one computer per five students. Software licencing, made much of at the time, constrained multiple use of some of the software. I often had my students working on at least six different activities, a different activity on each computer and at least one off-computer activity for the remaining students. I noted that when my students were working at computers, their attention was directed away from me towards the 'virtual instructor'. My experience was contrary to the DECCD's claim. Citing Swan and Mitrani (1993), the DECCD argue that computers changed the "structure of teaching and learning by increasing the number of student interactions with the teacher but also giving the students equal control" (1997b, p.55). This resulting sense of greater control over their learning, they argue, increased student motivation.

The successful implementation of a flexible learning program, whether it involves computers or not, assumes a highly adaptable and skilled teacher to respond promptly to those needing additional help and to ensure that those who complete

their work early or those who lack motivation continue to be productively engaged. A crucial issue for me was to remember that the computer did not care whether the answer was right or not, it could only indicate when a student made a mistake, but was not interested in *why* the mistake was made. Relatively few programs were available that analysed the nature of the mistake and then directed the student to appropriate further learning experiences. At the time of writing in 2008, it remains very important that we question our classroom and teaching practice and take note of Armstrong and Casement (2000) who state, "When we are able to add emotional input into learning experiences to make them more meaningful and exciting, the brain deems the information more important and retention is increased" (p. 47).

For me, an 'emotional connector' in the classroom was the relationship between my students and me. The DECCD claim, as above, that the very relationship between students and teachers will be challenged because the technologies enable students to gain control of their own learning and to have access to information that was once under the control of teachers. In the past, schools had been places where teachers, in authority, decided what would be taught, and possibly learned, at what age, and in what sequence; teachers also decided what would not be taught and what would not be approved knowledge. I felt that the expectation that I make maximum use of these expensive resources represented by computers changed for me what it meant to be a teacher. An example was the change in teaching emphasis and practice, away from specific literacy and numeracy instruction, to focusing more on computer software programs. It also changed the way we related to each other and our classroom routines, altering the rhythm of our classroom and the way I worked with my students. Such a shift had unintended consequences with significant implications for the curriculum, teaching and learning, as well my relationship with my students. Perhaps it was as Perelman suggests

> Although learning and teaching used to be a solely human process, learning has recently become a trans-human process that partners humans with powerful neural networks, expert systems, and automated learning machines. (Hutchison, 2004, p.117)

The DECCD emphatically state that computers contributed in different ways to how teachers teach and students learn in a positive way, that the effective implementation of computer use changed teaching practices, bringing about

> ...more project oriented approach rather than teacher led activities; more student controlled learning; more engaged learning; more student involvement in authentic learning tasks; more individual interactions between students and teachers. (DECCD, 1997b, p.vii)

The use of the word 'more' four times is a language effect that signals unwarranted confidence by the DECCD, who argue that "the potential for using computers to facilitate social skills, especially collaborative group skills" appears to be considerable, perhaps "one of the most important in relation to students' learning outcomes" (1997b, p. 45). Citing Rowe (1993), Mehlinger (1996) and Tierney (1996) the DECCD claim that research findings suggest that computer presence actually increased the amount of social interaction among students, and did not cause students to become social isolates. I was not alone in struggling with these issues as Sarah confided:

> I wondered whether computers would give students something that would otherwise not be possible in books and other printed materials. Computers did not stimulate discussion and therefore disadvantaged students in terms of communication and talking together, which is vital especially for younger students? (Jordan, 2002, Working Paper 1, p.2)

The DECCD seemed affirmed in its belief in the 'goodness' of computers in school classrooms by yet another researcher, and cite Tierney (1996) who states that students interacted and collaborated in "joint construction of projects, co-operative ventures involving differential expertise, co-authoring, and side-by-side consultation and group sharing" (DECCD, 1997b, p.43). It also cites Reil (1994) who asserts that computer technology allows "co-operative learning to overcome geographic boundaries" and involves students who are "isolated because of disability, illness, geographic conditions or socio-economic factors" (p. 44).

In my classroom, when students were working in pairs at the computer, there was always a passive participant who wanted to interfere by touching the keyboard or was impatient and agitated as he waited for his turn. This often meant that a less dominant student would not be able to complete the set task on the computer, preferring instead to use the familiar pen and paper. So, rather than encouraging students to use the computers, these experiences caused them to return to the safety of what they were familiar with.

Thus novelty wears thin. The DECCD cites Joiner (1996), who claims, “computers enhance student motivation, concentration, confidence and self-esteem.” Joiner reports that students were enthusiastic about the use of computers irrespective of age, sex, ability, social class, or computer experience. This positive attitude persisted, albeit tempered slightly with experience, because this offered them “more fun”, with the perception that computers are “an adult tool” (DECCD, 1997b, p.39).

Excitement about the novelty of using computers seemed to continue into 2008. Crowne, writing in 2008, reports that that the new technologies are still enabling students to have more control over their learning by means of access to information that was once under the control of teachers and, for students, using computers “feels like an extension of what they do in their free time” (Crowne, 2008, p.2). What the DECCD is claiming in their 1997 document is still claimed in 2008. The Apple Schools of Tomorrow (ACOT) study 1986-1996 claims that although “excitement...with the novelty of having new activities supported by technology subsides, enthusiasm does not” (DECCD, 1997b, p. 39). The DECCD contradicts ACOT somewhat, citing Rowe (1997) who reports a decrease of between fifteen and thirty percent in student enthusiasm over eighteen months, especially girls. This disaffection appeared unrelated to student ability levels and, increased “as confidence in using the computer to work effectively grew” (DECCD, 1997b, pp. 39-40).

Beynon and Mackay (1993), not cited by the DECCD but writing at the same time as others cited by the DECCD, attribute student motivation towards computers to their association with computer games, and they question whether motivation would dip when the software available in schools was superseded by ever more exciting

products. The DECCD notes that Rowe (1993) as well as Johnson (1996) suggests that when students are engaged in using the computer they will persist on tasks for longer than they would otherwise. Here we have two opposing arguments: one says that student excitement subsides and enthusiasm does not; the other says enthusiasm subsides.

After my 'Computer Immersion' trial in 1994, I report that I found computers helped some of my students to develop confidence, motivation and a willingness to learn, especially in word processing even though the computers did not have spell checkers. This was not my experience post-1997 as there were students who already possessed the necessary word processing skills, but chose not to use the computer because it offered them no 'added value' in terms of creative presentation, or because the equipment available in schools was slower or less sophisticated than that available at home. This was especially evident among the girls who often preferred to write by hand and illustrate their own work.

Another focus of the DECCD literature review examines differences between girls and boys in their use of and access to computers, and suggests a range of strategies that teachers needed to use to counter potential disadvantages to girls. The DECCD cite Spender (1995): "Girls have less access to computers in the average classroom," Rowe (1993): "Girls spend less time working on computers" and Shashaani (1995): "Girls have less positive attitudes towards computers and rate their ability in using computers as lower than boys" (DECCD, 1997b, p. vi). In the paper I published in 1994, *Computer Immersion in a Grade 5/6 Classroom: Key Questions and Management Issues, set one, 1997*, my findings support those cited.

> Although the teacher provided instruction in the use of the package, a form of cascade training quickly established itself due to the presence in the class of students [eight of the boys] who had been introduced to the computer soft and hardware on a smaller scale during the previous year. I have no data about home access to computers but the eight boys made active use of the facilities available in the classroom the previous year whilst there were no girls in the group described in this paper who did so. Within the

> co-operative ethos of the class, these more capable boys were able to pass on their expertise in the use of both the software and hardware very quickly. The activity of teaching others reinforced both the knowledge and the confidence of the 'expert' boys. One of them displayed weak academic skills but the recognition of his computer expertise considerably boosted his self-esteem.
>
> However, the peer teaching approach worked less well for the girls. At the end of the previous year, a discussion had been held with the students to explain about the planned computer immersion programme. At this stage, all the girls had been definite in their opposition to the idea, based on their previous experience in a class with one or two computers. They said that they had felt intimidated by the 'superior knowledge' of the boys, and embarrassed to use computers because the boys would 'interfere' by showing them what to do. Moreover, they complained that computer time was allocated disproportionately to the same group of students, mainly boys. Access to computers seemed, to them, to be granted as a reward for good behaviour or for rapid completion of class work and as a means of keeping troublesome students [again, mainly boys] busy.
>
> Although the number of computers in the new class made it unnecessary for any of the girls to share with the boys, they were reluctant to start using their computers. As time went on and they realised that they could work at their own pace away from the interest of the boys, they began to take risks and experiment. This more enthusiastic stage did not last, and most of the girls did not use their computers unless prompted by the teacher. (Jordan, 1997, p.2)

I agree with Armstrong and Casement (2000) who point out that computers cannot match a good teacher's ability to "inspire interest and excite" and speak with "passion and commitment" about ideas (p. 12). I soon discovered that the claims made by the DECCD about the potential or possibilities of using computers in classrooms did not always match my classroom experience. It is interesting, and important, to note that a published account from a local teacher, that is, the report of

my ‘Computer Immersion’ trial in 1994 went unnoticed in the DECCD’s review. Might this teacher’s account have added more authority to the DECCD claims?

The second, almost concurrently published document from the DECCD, to which I now turn, is Computers as a Tool for Teaching and Learning (1997a). This document appeared as a means for the DECCD to instruct schools on how to develop an ‘effective’ implementation plan for the introduction of computers into classrooms. It began with the proposal that each school should develop and propose a plan based upon the following questions:

- Has the school a vision with clear educational purpose for how computer-based technologies can enhance teaching and learning?
- Are there processes in place to find out how best to make use of existing as well as new technologies when they become available?
- Is the contribution educational computing makes to each Learning Area clearly described?
- Have curriculum materials and resources been deployed that make educational computing an integral part of teaching and learning?
- Have appropriate school and classroom organisational arrangements been devised to achieve optimal and equitable use of computing resources?
- Has an adequate range of generic tools and other educational software been examined and selected?
- Are there processes in place to support teachers and students in the use of computing tools and resources in their classrooms?
- Is there a professional development program for teachers and other staff in how to use and apply educational computing?
- Has there been collaboration with other schools or clusters of schools to share resources and good practices?
- Have priorities been established and funds allocated?
- Are there adequate plans for the maintenance and upgrading of the school’s computer systems?
- Are the plans for educational and administrative applications integrated?
- Has the whole school community including the School Council had opportunity to participate in producing answers to these questions? (DECCD, 1997a, p.9)

In addition, a school's plan for educational computing was to take into account current levels of knowledge and skill using computer-based technologies. This required a "careful assessment of the needs of students, teachers, parents, librarians and school managers; and then provision support to meet those needs" (DECCD, 1997a, p.9). It was not surprising that, to many of my colleagues, the above questions were 'just questions on a page.' We were not invited to participate in a dialogue that such questions might have stimulated.

To engage teachers with some guided discussion of the above questions would have been common sense. I had the advantage of my 'Computer Immersion' trial in 1994 as a context to reflect on how the above issues, 'embedded' in the questions, might change my classroom practice. But my colleagues, who had no such experience, were apprehensive and, in some cases, overwhelmed. The DECCD, citing Smyth (1997), points out that, when teachers are expected to take on new curriculum initiatives, it is understandable that some will find the "current emphasis on technology across the curriculum daunting and overwhelming" (1997b, p.56). At the same time, in the literature review, the DECCD suggest that winning over teacher attitude and beliefs on behalf of technology is important as many teachers are "tentative and fearful of using technology in their classroom."

> After proclaiming the potential of the new tools to rescue the classroom from the dark ages technologists find to their dismay that teachers can often be persuaded to use tools only slightly, if at all. (DECCD, 1997b, p.56)

Some of my colleagues considered that computers were anathema to their notion of what schools ought to be doing with and for students; what they were being asked to do was totally unacceptable. Others had a fear of being replaced by a computer, and objected to what they saw as the 'de-skilling' of teaching because of the pressure to alter the teaching practices that worked for them in the past. Some were daunted by the ease with which their students adapted to computers. The DECCD recognise this pressure and their literature review cites Smyth (1997) who says that it is obvious that the main issue for schools is the "equipping of teachers with the skills to use computers confidently and competently and the knowledge of how best they can be

incorporated into the learning process" (DECCD, 1997b, p.2).

The ways in which some of my colleagues reacted to the introduction of computers in their classroom appeared to depend upon several factors. These included their attitudes and beliefs about computers and teaching, some very pragmatic aspects of how the computers were provided and supported, the whole school culture and school context, and the level and type of professional development that they experienced, believing that effective professional development was very important to the successful use of computers in classrooms. If teachers had considered that the DECCD was imposing computers on them, if they sensed their colleagues perceived them as being 'computer illiterate', and if a sense of their own ineptitude engendered feelings of incompetence, it would have been difficult to implement computers successfully into classrooms in their school. In my school it was evident that some of my colleagues resented not having a choice as to whether they could have computers or not. They felt overwhelmed, stressed and unable to cope. Others welcomed computers and managed to incorporate them into their teaching program in some way. A consequence was that those teachers who displayed competence with computers attracted higher esteem amongst their colleagues. They had earned *kudos* as those less 'computer able' demanded more and more assistance from them. Sarah had a little less apprehension than others,

> I saw an immediate application of computers. I wished to improve my teaching practice so it was an opportunity to bring this added dimension of technology to my teaching and learning. Computers were touted as being a comfortable extension to a classroom's arsenal of tried-and-true teaching strategies. I, coming to computers with no background or contextual knowledge but with 'fear', was 'assured' that 'just like a washing machine I can use one without understanding how it works. Likewise I don't need to understand how a computer works. (Jordan, 2002, Working Paper 1, p.3)

The use of computers and the purpose for which my colleagues used them seemed to depend upon a range of factors such as their age, level of training and experience,

and the extent to which they used a computer at home. The stress that some of my colleagues felt was increased by the expectation of the DECCD, with their document claiming that there are many ways in which teaching practices can be strengthened when information technologies are effectively incorporated. These include a "more project-oriented approach rather than teacher-led activities; more student involvement in authentic learning tasks; and more individual interactions between students and teachers" (DECCD, 1997b, p.vii). But to achieve this, according to the DECCD document, a thorough understanding of computers and the programs to be used in classrooms is essential if teachers are to inspire their students, provide initial instruction, deal with problems arising, and achieve the objectives set out by the DECCD. Above all, teachers are to ensure that students gain access to the benefits of the technology available.

Why did the DECCD prefer a machine-led activity over a human-centred one? Why was the DECCD emphasising 'more', 'more', 'more', 'more'? Apparently, the DECCD was offending teachers, displacing them and discounting them. Was the DECCD missing the essential message that teachers needed most to hear? In the literature review one cannot find evidence for the DECCD having considered greater minds. Teachers could well have been composed by a catch-cry from Postman: for all "their dependence on machinery, tools ought to still be their servants, not their masters" (1993, p. 46).

Mastering the technology was the easy part for most of my colleagues. It was the transfer of knowledge, skills and methodology associated with each learning area, and our own method and style of teaching in a computer-led learning environment which made the heaviest demands on the teachers' as well as the school's time and resources. For example, making a number of physical changes to the organisation and layout of our classrooms meant that the addition of a number of computers into each classroom required us teachers to rearrange our learning spaces, and had a significant impact on our way of 'being' in our classrooms, where space for book shelves, extra work tables, and mat space for whole class activities became restricted. This meant that the physical presence of computers determined the teaching and learning style in my classroom, for one.

The DECCD document provides a different view:

> ...through technology, a classroom is transformed into a multi-task work environment as the focus is on effectiveness and collaboration, rather than compliance and obedience. Fully integrated classrooms promote maximum use of the computers at times when they are needed by individuals and / or groups of students. The computers are distributed around the classroom in ways that enable them to be used as ubiquitous tools for teaching and learning. (1997a, p. 17)

The word 'ubiquitous', like its dictionary meaning, 'present, appearing or found everywhere', occurs a number of times in *Computers as Tools for Teaching and Learning*, (1997a). It was not possible for computers to be ubiquitous in classrooms with one computer to every five students.

My experience in my 'Computer Immersion' trial in 1994 has shown that introducing new technologies into schools without appropriate staff training can lead to negative teacher attitudes, often leading to discarded equipment. The DECCD supported professional development for teachers citing several researchers. Edgar's experience (1990) with the Apple Classrooms of Tomorrow (ACOT) program finds that the most successful approaches in offering professional development to teachers include small group collaboration between teachers in working classrooms, building on teachers' existing knowledge about curriculum and place, providing opportunities for teachers to experiment and reflect on new experiences, and ongoing support to help them implement change and innovation is this a quote – where does it start and end?(DECCD, 1997b, p.61). Grunberg and Summers (1992) emphasise that the issue of introducing computers into schools would be "influenced by the same factors that influence any other educational change" and list three major dimensions of change as "teaching materials, teaching strategies, and teaching beliefs" (DECCD, 1997b, pp. 57-58). Implementation ought to occur in all three dimensions for the desired outcomes to be achieved. The document *Computers as Tools for Teaching and Learning* (1997a) was the DECCD's gift to teachers to support this practice.

Yet, in my school, limited opportunities were given through professional development sessions for teachers to discuss potential teaching strategies and the day-to-day classroom routines that would need to be introduced or would be imposed because of the presence of computers in the classroom. Few discussions of related teaching beliefs and understandings were encouraged or facilitated. To question was to be a 'Luddite'. There was no recognition of other important factors like the need to consider the teacher in the context of the social and collegial organisation of the school, rather than in the isolation of their classroom,

> Computers do affect what teachers do, but perhaps not in the way exponents often assume, as a direct change agent. We see computers more as a stimulant, an important new symbol with which teachers interact in complex ways. (DECCD, 1997b, p.58)

To ensure readers that the DECCD indentified collegiality as a key factor in insuring effective computer use by teachers in classrooms, the DECCD document cites Becker (1994) to stress the importance of "collegiality among users, school support for using computers for consequential activities, and resources allocated to staff development and computer co-ordination" (1997b, p.58). The document continues, citing Smyth, and emphasises that programs to introduce information technology are most effective

> ...when introduced in the context of a vision of what learning experiences the school wishes to provide for its students – a whole school approach to innovation and change is essential...including a feeling of ownership by the staff. (DECCD, 1997b, p.58)

The DECCD expands this view by citing Wellburn (1996) who suggests that "the coherence of the vision" is important, as is the extent to which it is "a unifying force among teachers" (1997b, p. 8). The level of teachers' knowledge and skill is also a major factor in promoting the appropriate use of computers in classrooms.

> ...a major implementation pitfall is failure to provide teachers with adequate professional development in technology. Teachers need

> to be trained to use the technology and to apply it instructionally with particular curriculum. (DECCD, 1997b, p.59)

The DECCD refer back to Rhodes and Cox (1990) who assert that a major problem with teacher professional development is that programs designed to help teachers incorporate information technology into their classrooms have a problem with the balance between the technical aspect of computers and the educational implications. The DECCD assumes "with courses concentrating up to ninety-seven percent of the time on technical aspects, teachers would be able to use the resources effectively in the classroom having spent only three percent of the time discussing educational applications" (1997b, p.59). To parry this, the DECCD, with the support of Ringstaff and Yocam (1995), state that in 1997 the methods of professional development are "woefully inadequate" because they focus on "learning about computers rather than on learning how to integrate computers into the curriculum" (1997b, p.59). Lewis (1994) reports that teachers want 'hands- on' computers with opportunities to collaborate with peers. Wellburn (1994) concludes that it is clear that "...simple motivational and short workshop schemes are vastly insufficient to enable veteran teachers to teach differently, and to teach well with technologies" (DECCD, 1997b, p.59-60). Gardner (1995) states:

> ...the lack of attention to teachers and the technologies is ironic, for at the centre of effective use of classroom technologies by students, are those who oversee the daily activities of the classroom – the teachers. To use the technologies well, teachers need more than just access to these resources, they also need opportunities to discover what the technologies can do, to learn how to operate them, and to experiment with ways to apply them in their classroom. (DECCD, 1997b, p.51)

Ryan (1991) suggests that teacher computer training is significantly related to the academic achievement of students—short-term training is ineffective and counterproductive. Those planning training are to "be aware of the multiple competencies required for effective computer use. Not only curriculum knowledge and content pedagogy, but also computer concepts...and the understanding of the

relationship between the students and interactivity of computers, are required of teachers" (DECCD, 1997b, p.60).

Teachers needed time to experiment with computers in their classrooms and to implement good computer-based activities within the curricula,

> Schools that give teachers adequate time to acquire technology skills, plan technology based activities, and share their technology related work with each other are more successful in bringing a large number of teachers to a level of technological proficiency. (DECCD, 1997b, p. 60)

The DECCD conclude that "the professional development approaches that appear to be most successful for helping teachers to use information technology successfully are similar to successful professional development in any other area" (1997b, p. 61). It adds no more specific detail or methodology for conducting professional development for using computers in classrooms.

Even though the DECCD review, and subsequently quote, in its literature review, a number of sources reporting that an effective professional development program must include effective teaching and learning strategies for teachers, they did not follow their own advice in my school. From the distance of time, I can now see that the implementation of computers in Tasmanian classrooms was based on getting computer hardware, software and its associated technical support into schools quickly. The conclusions of the DECCD's review might have sounded sensible and aware of the importance of providing professional development opportunities and the necessary technical support. But teachers were to hear mostly rhetoric, as there was no discussion with them. They were simply told that they were getting computers into their classrooms at a ratio of one computer to every five students. Consider what the DECCD did not perceive either in its literature review or in its *Computers as Tools for Teaching and Learning* (1997a) document.

Winner (1986) points out that in some cases "adaptation may precede the use of new tools/technologies." Any given device might have been designed and built in such a

way that it produces a set of consequences logically and temporally prior to any of its professed uses - we "see the importance of technical arrangements that precede the use of the things in question" (p.25). Beyer and Apple (1998) express the view that increased use of computers increases reliance on "formal characteristics of knowledge at the expense of the tacit and interpretative dimension of knowledge which can never be separated from each other, but the tacit dimension can only become hidden." (p.303) Hence, they argue, computers force us to act as if we are "rule-governed information processors" and to construe thinking as "cognitive problem-solving" where the solutions are arrived at by "formal calculation, computation, and rational analysis" even if we are

> ... active and constructive and intuitive in our approach to the world, when we use computers, we must analyse and reduce problems into 'explicit and procedural terms' so the image or concept of the computer as an intellectual tool as is often spoken of in schools, is not a neutral formulation because it forces us to 'objectify ourselves as agents of prediction, calculation, and control' Personal intellectual agency has thereby been limited to the technological framework' (Beyer & Apple, 1998, p.303)

Why did the DECCD omit to deliberate upon the socio-cultural capacity of computers to neutralise and objectify our human agency? Think of Postman's warning in his exposition of Technopoly (1993). The two DECCD documents do not foreshadow any danger of what could occur in our world if human invention were to develop machines, computers that could imitate the human mind. It seems to me, in this reflection, that we have a deeper obligation toward the education of our students and to develop a finer sense of responsibility for their social and cultural development as well as for their moral welfare.

Chapter 5

The Grand Plan

On the cusp of the centuries, the grand plan of the Tasmanian Government to embrace computer technologies as essential for preparing students for the challenges of the future workforce was to become a source of harrowing effort and disappointments for many educators who were, at first, willing to step forward with their masters. Ever vigilant, ever trawling national and international government education initiatives and policy to provide the electorate with world-class education, the Tasmanian Government made a considerable effort and commitment of funds to equip all publicly funded schools with modern computers "to ensure that students are prepared to live and work in the information age, as well as to facilitate teaching and learning" (DECCD, 1997b p. 11). This effort began in earnest in 1997.

In Western developed countries, it seems that we are expected to accept the certain wisdom that is metered out and presented by those deemed with authority to say and acclaim that information technology is the key to economic success. For example, Ashley Goldsworthy, in his report for the Information Industries Taskforce, cited by the DECCD, says,

> If we [Australia] as a nation are to compete in the global marketplace in the decades to come we must become leading and proficient users of information technology. (DECCD, 1997b, p.1)

Pamela Mendels, writing in the New York Times in 1999, acknowledges that we would indeed need computer skills but that these skills would alter as rapidly as computer technology evolved. It would make little sense to teach students skills that would be outdated by the time they left school. We might well ask, was the Tasmanian Government premature in its 1997 endeavour?

In 2008, at the time of writing this thesis, we can still read claims that "technology will make teaching and learning a more exciting, rewarding and successful

experience" (Crowne, 2008, p. 3) and more "productive, relevant, and interesting" for students of all ages. Students will learn more quickly, because they will be more motivated and "because their intellectual horizons will no longer be limited by the resources of their school or the knowledge of their teachers" (Armstrong & Casement, 2000, p. 2).

In this chapter, I outline the DECCD's 'grand plan' to gather 'evidence' from sources around the world, to justify their computer roll-out. I question whether they were too ready to accept the view that computers in schools are essential to the future work opportunities of students and have importance for economic prosperity. I had rigorously applied myself in my search of the heraldic documents. I found no mention in the 'grand plan' of a deeper layer of educational purpose, the cultural, moral or ethical purposes that are the concern of my philosopher writers.

I discuss the 'traps of first impressions' as I search for an 'emotional connector' through the very human activity of hand writing and wondering what we may lose by using a word processor. In the section that I have entitled 'the infancy of masses of information', I wonder about the quality of information and whether students are taught adequate skills to be functional and ethical users of the Internet. There I find questions that are both disturbing and daunting: we might never find their answers.

In their document, the DECCD cites Rowe (1993), who reports, "schools, parents and others have shown themselves to be highly susceptible to the promise that the introduction of computers will provide the definitive answer to teaching and learning" (1997b, p. 9). Even more significantly, "familiarity with computer technology is seen as a prerequisite for a successful career not only merely programming a computer for the sake of acquiring technical expertise, but students should use computers to teach them how to think" (Armstrong & Casement, 2000, p. 2).

Did the Tasmanian Government take on too quickly and with too little questioning what was generally being touted that computer technology was often seen as a means "to ensure an efficient delivery system of human re-sources" with the "generic, technical, problem-solving skills required within technological systems of the new

global economy" (Beyer & Apple, 1998, p. 269)? Did they not know that Steve Jobs from Apple Computers was already suspicious of such claims when he said,

> ...what's wrong with education cannot be fixed with technology... no amount of technology will make a dent ... you're not going to solve the problems by putting all knowledge into CD-ROMs We can put a web site in every school ... none of this is bad. It's bad only if it lulls us into thinking that we are doing something to solve the problem with education. (Steve Jobs cited by Oppenheimer, 1997, p. 22)

Back in 1997, there was little research evidence about the contribution of computers to teaching and learning within Tasmanian schools, and so the DECCD conducted a review of international literature. Although many claims exaggerate the positive effects of technology for education such as Hawisher and Selfe, (1996), Wellburn, (1997), Owston, (1997), Rowe, (1993), Hawkins, (1996), Baker et al., (1996), Benton Foundation, (1997) and Stevenson, (1997), the DECCD's literature review nevertheless concludes that "a more realistic and balanced view of the use of information technologies gradually emerged" (DECCD, 1997b, p. 8). To strengthen their case, the DECCD cite three international reports in their literature review. It is necessary, in this early part of my discussion of the Tasmanian Government's decision to roll-out computers into every classroom, to raise certain questions. For instance, does the DECCD's tendency in the review to talk about '*the* literature', mean reference to a set of research and inquiry findings or is it simply referring to a set of *writings*? Does reference to 'current literature' mean reference to current research and inquiry?

The first report that the DECCD cites is from the Ministry of Education, British Columbia, in 1996, which states that "most of the more current literature is overwhelmingly positive about the potential of a variety of technologies to be powerful components in accomplishing educational visions." The report recommends further research, to "determine *how* information technology can improve student learning" (DECCD, 1997b, p.62).

The second report the DECCD cite is from the US Department of Education (1993). This report recommends research into "various facets of the innovation and the implementation process and how teachers and students use the technology" (DECCD, 1997b, p. 62). A third report cited is the United Kingdom's Stevenson Report (1997), which asserts that "it will be a long time before there is conclusive evidence to justify the substantial investment by the community they believed would become necessary" (DECCD, 1997b, p.62). The UK Stevenson Report assumes a generally beneficial outcome without consideration of what may be lost as a result. It recommends that the UK Government make an "act of faith and that we *use* the technology, rather than *study* it over the next decade" on the grounds that, by the time the evidence became available, "a generation or two will have lost out" (DECCD, 1997b, p.62).

The DECCD document concedes that there are hundreds of books and journal articles about the use of computers in schools and it is not possible to cover them all so it subscribes to an 'act of faith' for widespread incorporation of computers in classrooms, "the information and communication age is here whether we like it or not. To fail to equip students to function in this new age would arguably put them at a substantial disadvantage" (1997b, p. 2).

Tasmania was not alone in making this 'act of faith'. Internationally, a later survey of educational policies in the European Union (EURYDICE, 2001) reveals that, by the turn of the twenty-first century, schools were increasingly gearing up for the use of computers, not least to prepare students to live and work in a complex society where there is a vast flow of information and rapid change. For example, the Netherlands Government was already making a high level of investment in technology in schools around the same time as the DECCD, despite research evidence that many Dutch students learned their computer skills "mainly at home" (EURYDICE, 2001, p.188).

Whilst the stated educational objectives transcended national borders, speculated learning outcomes varied. Le Métais (2006), reflecting on the European position around the time when the DECCD were compiling the literature review prior to 1997, reports that the ability to use computers as tools is a universal goal for primary

education. In addition, Le Métais (2006) notes that students "may also be expected to make appropriate and skilful use of specific applications such as text, data, graphics, design and manufacture communications relevant to the subject area" (p.188).

When evaluating the applicability of international research outcomes to the Tasmanian educational context perhaps the DECCD ought to have taken careful note of the "necessary conditions" that contributed to improved outcomes, such as class composition, curriculum and teaching style that could influence research findings. The Economic and Social Research Council in the United Kingdom recognise this when they state, "Cross-national experience is having an increasingly powerful impact upon policy makers ... but is often based upon a superficial understanding of programmes and institutions and of the conditions that contribute to their success or failure" (Economic and Social Research Council, 1998).

Did the DECCD carefully evaluate, with particular attention to the possibility of unintended outcomes, any positive outcomes, characteristics, factors and context that they believed would contribute to the success or failure of computers in classrooms? Did the way in which the DECCD introduced computers into Tasmanian schools produce unintended outcomes and unforeseen losses? Have such outcomes and losses arisen from policies that have focussed upon the use of technology as an end, rather than a means, of education? Did the Tasmanian Government make a leap of faith assuming that access to information was synonymous with becoming knowledgeable? Did government decision-makers recognise that it was the way in which technologies were used that made the difference between simply accessing information and acquiring knowledge?

Whilst the DECCD document acknowledges that terminologies and definitions are changing rapidly, they indicate that 'information technology' is the most commonly used term in the literature to refer to all technologies that utilised a computer.

> Information technology is the broad term for all aspects of managing and processing information, especially within an organisation or a business. Because computers are central to information management, computer departments and sections of

> organisations are often called ‘information technology departments’. The term ‘information technology’ is most commonly used in the literature to refer to all technologies that utilise a computer. For this reason the present paper uses the term in that way. (DECCD, 1997b, p. 3)

The DECCD use other terminologies such as “educational computing” and “computer-based technologies” as well as “learning technologies” in their documents. Educational computing means the planning process requires the development of an implementation team within the school with explicit goals and a detailed description of how these goals are to be implemented over time. Some of these goals include “a vision with clear educational purposes, with the contribution to each learning area clearly described”, “school and classroom organisation”, as well as “professional development and maintenance and upgrading of computers” (DECCD, 1997a, p.9). A school resource teacher was nominated in every government school to lead and co-ordinate the school staff and the parent community through this process.

‘Computer-based technologies’ “which are to expand the repertoire of methods by which students can learn and teachers can teach” (DECCD, 1997a, p.2) referred to three categories of educational software: generic tools for learning, content-based resources and instructional programs. Generic tools include

> …word processing, freehand and geometric drawing, collecting and organising data, analysing and managing, presenting and displaying information. As are modelling and simulating ideas, communication in text and graphics, constructing sounds and images and creating interactive multi-media and finally, controlling mechanical and electronic devices. (DECCD, 1997a, p.1)

Content-based resources are a “vast source of ideas and information” giving students and teachers access to experiences which they would not otherwise have and refer to the Internet and CD ROMs as examples. Instructional programs refer to “highly

structured, self-paced instruction, which can cover the whole curriculum [and] are targeted to specific areas of learning" (DECCD, 1997a, p.3-4).

The term, 'computer-based technologies' describes the software in terms of its technological status and function. The DECCD do not explicitly convey a purpose for computer-based technologies or suggest how students in the classroom should use them. By their very structure, computer-based technologies impose pre-determined attitudes and actions of the programmer and require the user to operate within these parameters. The perception conveyed by Algar at River Oaks and quoted by the DECCD (1997a, p.2) that computing tools are "nothing special, they are "just there and transparent" could place it at Postman's Theocracy or tool-using-end of his technological cultures. However, the structure that computer-based technology imposes does not preclude us from locating it in Postman's Technopoly at the same time. It is just that the DECCD did not seem to be aware of the dangers of the unintended consequences of Technopoly.

'Learning technologies' stress the importance of the learner's agenda, suggesting that the technology only be used insofar as it meets the learner's needs. It leaves open the intended learning outcomes, which might be specifically technological or, more generally, knowledge, skills and understandings. The DECCD, citing Goldsworthy, claim that one justification for using computers in schools is to ensure that students master "the application of information and communication technologies in their chosen subject areas" (DECCD, 1997b, p.2). Learning technologies are technologies that are used for learning, as opposed to other purposes such as business. The DECCD adopt 'learning technologies' as generic term covering all technologies used for learning.

Making a distinction between technologies that are used for learning, as opposed to other purposes such as business, might well have carried a mixed message, as the generic tools for learning identified as computer-based technologies had mostly been developed for business purposes. At the time, I wondered in which ways we, as teachers, would use learning technologies, whether we called them 'learning technologies' or 'information technology' to suit the learning needs of our students. Were we also to suit the requirements of the business community? Most of the

generic software we were to use was part of the Microsoft Office™ suite, one that almost every business used.

As the nature of electronic information processing requires specific linear ways of thinking by the programmer, and subsequent user, the software's way of ordering or classifying information may well draw the user into its field and at the same time limit the possibilities the user may have for accessing it. Two examples include contact databases, such as when a teacher subscribes to a website or an online journal where the database often predetermines the place of postcodes within an address. An American database will place the zip code before the name of the state; a student using a structured learning program to enhance her literacy skills could be constrained by having to progress in the same way as a factory worker on an assembly line. In both these cases, we could say that the individuals are operating within Postman's Technocracy; values and ways of being and knowing are beginning to shift with the experience of technology.

Here I find another Postman (1993) perspective when he says that the term 'information technology' has acquired a much more wide-ranging meaning than the DECCD exposes. He suggests that the new technologies, as well as introducing new words, change the meanings of existing words, almost without our being aware of it,

> The telegraph and the penny press changed what we once meant by 'information'. The computer changes 'information' once again. The old words still look the same, are still used in the same kinds of sentences. But they do not have the same meanings; in some cases, they have opposite meanings. (Postman, 1993, p. 8)

Theodore Roszak (1994) observes that "often repeated catch phrases and clichés" are enlisting "mindless allegiance and acquiescence: the term 'information' has acquired a meaning beyond the literal, and achieved an 'ambitious, global' definition that makes it good to all people",

> People who have no clear idea what they mean by information or why they should want so much of it are nonetheless prepared to believe that we live in an information age. (Roszak, 1994, (p. xiv)

Roszak talks about the emergence of a "folklore of computers", the "image of power" that computers evoke, the "illusions of well-being", and the "fantasies and wishful thinking" that this folklore has developed, in particular the inextricable linking of information to the public mind,

> Words that come to mean everything may finally mean nothing; yet their very emptiness may allow them to be filled with mesmerizing glamour in particular words like 'the information economy', and 'information society'. (Roszak, 1994, p. xiii)

The speed with which computers can store, search for and retrieve information has vastly increased the volume of information that we collect and store in schools and elsewhere. We must reflect upon the dangers that occur when government and other agencies collect voluminous data for the sake of it, even when they are unable to process it and, in some cases, even when the purposes for collecting information are not yet clear—but it is collected 'just in case'. At this point, we can see Postman's Technopoly quite clearly where using the technology becomes an end in itself, and where electronic information and processes are deemed superior to humans in their information collecting capacities.

The DECCD's review of the literature draws upon two hundred and nineteen research documents to support the departmental technology initiative. The review argues that, "There is now sufficient research to provide a more balanced discussion on the value of computers in education. It is therefore possible to draw a more realistic picture of what computers can and can't do" (1997b, p. v).

The literature review acknowledges potential weaknesses in the research findings, such as the speed of technological change that was making it difficult to generalise about earlier research evidence. Some research findings would, without doubt, risk being superseded almost before they were published. On the other hand, some

research findings could under-represent the benefits of introducing computers to classrooms because “the potential of some technologies have not even begun to be realised” (DECCD, 1997b, p. v).

In listing the potential weaknesses, the review points out some methodological inconsistencies, such as the lack of appropriate control groups or over-reliance on anecdotal evidence that could invalidate the findings of early studies. Research questions could have been simplistic or only focused on short-term effects. The novelty of having computers in the classroom might also have created a ‘Hawthorne Effect’ that could enhance both teachers’ and students’ performance which, in turn, could have declined when the novelty wore off. In those days, I believed in and wished for longitudinal studies to measure lasting effects and identify those which could take time to emerge. I knew that such studies would be difficult to conduct due to the likely speed of change of technology during the 1980-90s.

Much of the early literature cited by the DECCD’s review assumes that the computer will be responsible for any changes in student results. Whilst one might observe such correlation, one would find it difficult to isolate the causes or sources of any change. “Computers cannot be regarded as an independent variable that can be introduced into a classroom with the effects then observed and measured,” notes the DECCD (1997a, p. 11). When it becomes part of the students’ learning and their social environment, it therefore becomes “inextricably intertwined not only with the way in which students may go about tasks, but also with the whole context of teaching and learning” (1997b, p. 11).

The DECCD’s reservations expressed in 1997 continue to hold in their 2008 publication of the *Information and Communication Technology Statement* as part of the Tasmanian Curriculum, the current Tasmanian Government’s educational directive on curriculum. Even if improved methods, more sophisticated questions and longitudinal studies were indeed to show student performance gains, it would still be difficult for the Department of Education (DoE), Tasmania’s 2008 name for the education collective, to isolate the relative impact of any given variable. At the time of writing this study, in late 2008, it is possible to identify a whole range of factors which could influence student outcomes, including the way the technology is

used, the purpose of using technology, and the learners' goals. Educational content and instructional paradigms are considered important in the 2008 document, as are the commitment and skill of the teacher and the motivation and wellbeing of students. It is possible to isolate and track some aspects of student performance according to specific variables, such as gender, age, and ethnicity, as well as classroom factors such as class size, and the quality and quantity of equipment. It is also possible to describe and evaluate teachers' experience and technological expertise.

But prior learning and experience are virtually impossible to quantify in terms of their effect on a particular learning experience. For example, teachers who have all the skills of high performers could still do less well in a computer task than other teachers, with fewer skills, but who have prior experience of, and greater access to computers. The DECCD document does acknowledge that the most often repeated finding in the literature about the use of computers in the classroom is that it would only change learning if teachers changed their teaching. It was perhaps unfair that even before computers were introduced in the 1997 roll-out, with in-school support, the DECCD states that "in some cases, the experience has been less than optimal, with teachers being inexperienced and often untrained in their use" (1997b, p. 12). If they were inexperienced and untrained of course their performance would be less than optimal!

I wish to turn now to the second of the DECCD's documents of 1997. This arrangement seems logical but, ironically, the literature review was not in circulation until *after* the distribution of the second document to which we are now turning: *Computers as Tools for Teaching and Learning (1997a).*

In this document the DECCD claim that governments, businesses and others express the view that students need to be introduced to computers early through a strong presence of computers in schools. The DECCD note that the extent to which educational computing enhanced student learning outcomes depended on the "intentions or purposes" for which they were selected and applied. The most important of these was student learning. "Computer-based technologies could be used as tools for learning and teaching in a variety of contexts across all areas of

learning from kindergarten to year twelve" (1997a, p. 4).

The DECCD frequently expresses the outcomes for, and examples of, computer use in the classroom in terms that suggest that the use of computers was the intended outcome of learning, rather than a means to achieving wider learning outcomes. For example, Table 1 *Good Practice for Students*, in *Computers as Tools for Teaching and Learning* lists the 'intended outcomes' and provides examples of student activities and behaviours that demonstrate these learning outcomes. Five of the intended outcomes are specifically related to the use of computer-based technologies which include being able to use computers for a range of purposes, developing knowledge and skills, developing an understanding of the role of computers in society and critically interpreting and evaluating computer mediated information by developing appropriate attitudes to the use and development of computer-based technologies.

A sixth outcome, "develop skills in information management", allows teachers to interpret these descriptions more widely and could include information derived from spoken or written sources such as the media, literature, friends and family. All of the examples of student behaviour listed relate solely to electronically stored information (DECCD, 1997a, p. 5). I was never sure to what extent that I, as the teacher, was expected to optimise the achievement of these objectives.

The DECCD does stress the importance of context in "gaining a realistic picture of how best to use educational computing in classrooms" (1997a, p. 4) but it offers teachers no examples of how computers may be used in any given context. It was my experience that, in some cases, the use of computers undermined the achievement of wider educational objectives by 'distracting' my students and I from other ways of achieving our goals. Perhaps part of my distraction was the DECCD's imposition of computers as an efficient way for students to learn basic skills by using drill and practice programs.

The DECCD also claim that schools can make efficiency and productivity gains because computers can "convey far more knowledge and skills to students in less time" than teachers (1997b, p.vi). Le Métais asserts that this emphasis on efficiency

was consistent with one of the dominating values of the period in which the DECCD conducted the literature review, especially in the USA and the UK, where schools were increasingly held accountable for providing "value for money", measured through standardised tests and expressed in terms of the achievement of educational targets (1992, p.118). US and UK systems encouraged computer use in classrooms to develop problem-solving and decision-making skills. They assessed success purely in terms of successful computer use (Armstrong & Casement, 2000, p. 11). This emphasis is reflected in the 2008 Tasmanian Curriculum, Information and Communication Technologies documents. The limitations of computers with respect to making decisions or solving problems constantly causes one to reflect critically on how narrowly based the DECCD's computer roll-out was in 1997 and how such limitations might well have foreshadowed an inexorable pathway into Postman's Technopoly.

The DECCD identifies what it claims is a series of benefits derived from the use of computers in classrooms. "As tools, computer-based technologies contribute in different ways to how teachers teach and students learn in each of the eight nationally agreed learning areas" (DECCD, 1997a, p. 15).

The DECCD list ways in which the computer may help students "access, extend, transform and share" ideas and information. "Access, extend, transform and share" was to become the mantra of the DECCD's proponents. To this day, the DECCD's mantra raises issues for me on three levels, namely: the attribution of human brain capacities to computers, unrealistic expectations, and an assumption that just because we can do things by computer, we should. Human capabilities were (and, incidentally, still are in the 2008 curriculum directive) further attributed to computers in activities such as "explore different views" "analyse data" (Maths), "make generalisations" (Science), "identify editorial decisions" (Study of Society and Environment) (LOTE), and "summarise key points in order to produce a text in another genre" (English) (DECCD, 1997a, p. 16). Whilst computers might offer ready access to a selection of sources, in each case the activity requires the human brain. It was my role as the teacher, not the computer, to help students develop the criteria or conditions for exploring, analysing, identifying and summarising the material being accessed.

As an example of such unrealistic claims, I wish to consider here the suggestions for Learning Languages Other Than English (LOTE) offered in Tasmanian schools post-1997. The potential that electronic communication offers cheap, fast access to people speaking languages other than English in their natural cultural communities is developing. Emails and video conferencing, time zones permitting, offer potential to add a realistic purpose to language learning. It is very difficult to produce accented or specialist characters in standard email packages, normally developed for English language users. Although competent linguists in, for example, French, can mentally 'insert' missing, accented symbols according to the context, is it acceptable to encourage students to write French in this way? An analogy would be. Do we accept 'txt spk' as a proxy for standard English for school purposes?

In *Computers as Tools for Teaching and Learning*, the DECCD suggest that creating a LOTE book could be a way of making the learning experience more authentic. But as a teacher who was continually reflecting on my practice, I asked myself, what is the purpose of such a book? Who is the intended audience? What is the intended readers' level of competence in the language(s) concerned? It was difficult to imagine that the LOTE competence of upper primary age students would be of a sufficient level to enable them to produce a text that would interest their peers overseas. Anything less, in terms of accuracy or of linguistic complexity, would undermine authenticity. Even the meaningful compilation of a book, using extracts from other sources, would require a high level of passive LOTE skills and could raise questions of copyright. Other examples, suggested by the DECCD, emphasise the production of newspapers, books or multimedia presentations and resources (1997a, p.16). I was forced to confront some of these issues during the 'Computer Immersion' trial in 1994 and expressed the following view,

> Computers add value by enabling previous work to be reused or transformed for other purposes e.g. written work, on different topics, may be combined into a single newspaper, magazines requiring students to consider target readership, style, structure, layout and so forth, and addressing curriculum objectives in language as well as in art and design. (Jordan, 1997, p.3)

I have since modified this view, and I am now wondering to what extent computer technologies might 'usurp' time from learning. For example, when students made a 'LOTE book with a publishing package', what would be the proportion of their time spent on creating a LOTE text, a language learning activity, as compared with that spent on preparing the publication, a computer manipulation activity?

One might have expected that some discussion in the literature review about philosophical reasons for justifying computers in classrooms for instance, would have occurred first. In the end, perhaps, it did not matter, as my recollection was that the literature review was not distributed to every teacher. Every teacher did receive a copy of *Computers as Tools for Teaching and Learning (1997a).* I was one teacher who sought out my own copy when I became aware of its existence but I later lost track of my copy. When I came to this study, I found I could only read it in the State Library, as copies of the literature review documents are 'as rare as hen's teeth'. For the rest of this chapter, to illuminate my questioning response to them, I will move back and forth between the two documents: *Does Information Technology Improve Student Learning Outcomes?* (DECCD, 1997b) and *Computers as Tools for Teaching and Learning (*DECCD, 1997a).

In the literature review the DECCD acknowledges that there is a limited amount of quality research on using computers to teach mathematics and numeracy (1997b, p.25). During the 1980s and the 1990s early computer software that was used to reinforce skills such as drill and practice, computer simulations, spreadsheets and graphic calculators designed to simulate a human tutor, is still being used in a more sophisticated form in 2008.

I noted that very few of my students were able to make use of this increased calculating power and graphic capability to plot graphs quickly and accurately and then incorporate them into multimedia presentations. And while some of my colleagues were enthusiastic about the potential of this software, we were very unsure whether such use would improve student achievement. Sarah, a grade two teacher said,

> ...some maths programs for extension or support work was available but I generally did not use computers only calculators, with young children, who discover concepts through talking and exploring with others, the available programs did not encourage this. Instead drill and practice or can you manipulate this square to fit into this space, ignores the importance of hands-on materials or understandings such as three fish and two fish as you hold up your fingers instead of trying to count on the computer screen and then struggle to find the relevant number key. (Jordan, 2002, Working Paper 1, p.2)

Whilst once again stressing the role of the teacher, the DECCD conclude that there is "considerable information to suggest that various technologies are being increasingly incorporated into the teaching of mathematics, with positive effects. While early drill and practice software probably is limited in its application, many of the most recent users of technology are proving very promising students" (DECCD, 1997b, p.28). The DECCD recall the views of Groves (1996), "Some mathematics becomes more important because technology requires it; some mathematics becomes less important because technology replaces it; some mathematics becomes possible because technology allows it" (1997b, p.28). This rings somewhat true today. What was available skewed the use of software. Today, the software is still at work skewing teachers' choices.

I wondered whether Grove's statement could also be said of science. My primary science lessons were mostly hands-on practical activities that gave my students the opportunity to experiment with various materials in a range of settings. The DECCD claim the effect of computers on teaching and learning science is an example of a learning area where there are "promising results" and they state that it can be expected that more recent applications of various technologies will have "far reaching impacts on teaching science over the next few years" (1997b, p.28-31). My understanding of teaching primary science was not to have students spending their time using computer software programs. Although I was willing to concede that Gardner, Simmons and Simpson (1992), cited by the DECCD, might be suggesting a reasonable balance when they report their findings that grade three primary students,

who used specific weather software, “achieved a significantly higher level than those who received traditional classroom instruction. The use of software combined with hands-on activities was more effective than software alone, but both methods were more effective than traditional instruction” (1997b, p.29). I still believed that so far, as Susan Rodrigues says and as cited by the DECCD, information technology had not been very well integrated into science teaching because of schools’ and teachers’ views of learning and because support had been “piecemeal and limited” (1997b, p.76). The DECCD draws upon “a growing body of research on how various technologies are being used successfully in relation to science education”, and provides some research evidence from Wilkie (1994), that “auditory narration and animation to visually represent concepts about the human body had a significant effect on the achievement of learning disabled, secondary biology students” (1997b, p.29).

The DECCD follows Rodrigues further. Rodrigues says that data logging, which links a computer with a sensor or probes and allows the measurement, presentation and analysis of data, proved to have a positive effect on students’ learning outcomes because it removed “constraining factors such as the ability to draw a graph, allowing students to concentrate on higher order thinking”. The DECCD continue their ‘trawling’ and find more “good support for using data logging to change the nature of children’s thinking in experimental work in science” by allowing them to “spend less time on obtaining data and more time on analysis and evaluating” (1997b, p.29).

The DECCD discover Dreyfus et al (1993) and Trumper (1994) who support the use of spreadsheets as having a positive effect on students’ learning by presenting results in a meaningful way. Added support is found in Straddling (1994), who reports that spreadsheets help students understand the links “between different variables in scientific formulae” (DECCD, 1997b, p.30).

The DECCD netted more support for their claims that computer simulations offer considerable possibilities in teaching science, especially when used to “simulate experiments” that might otherwise be “difficult or impractical”. Rodrigues (1996) supports computer modelling as a technique allowing students to “model and test

solutions". Schecker (1993) successfully uses modelling to help students "analyse kinematics, dynamics, work and momentum". Svec (1994) finds that on a test of graphing interpretation skills, "students did significantly better than students who only received lecture instruction", while Rodrigues (1996) argues that "using various forms of multimedia and hypermedia" allows science students to be "more reflective", and encourages students to "judge and present information more logically and thoughtfully". Various other researchers comment on the "positive potential" of using electronic communication in teaching science. For example, Robinson (1994) provides several examples in which science students use Email to improve learning outcomes. Harris (1994) finds that there is a benefit from teaching students to use the Internet to "gain scholarship and update existing science expertise and knowledge" (DECCD, 1997b, p.30-31). Indeed, the DECCD was finding bounteous sources for promoting the Tasmanian Government's roll-out of computers.

Traps of First Impressions

Just as first impressions in life are deemed important so it is with students' classroom work. There is a tendency by some teachers and parents to judge student work as being more successful if it has computer-generated neatness displayed for all to see. Although word processing and clip art might overcome the 'imperfections' of students' presentations, computer-generated formats depersonalise the work of students who lose their individual creativity because they must work within the constraints of the creativity of the software developer. As with first impressions, I tried to be mindful of the trap of making a judgement about my students' academic ability by the quality of presentation of their work. The DECCD document claims that student writing produced on a computer could "enhance their perception of themselves as real writers by bringing their writing closer to public forms of communication and adult models". Similarly, computer presentation would give their text "a better public image" (1997b, p.19).

I acknowledged, and still do, of course, that it did make students' texts easier for teachers and others to read, especially those students whose handwriting skills were poor and who may have seen the computer as achieving this outcome. But what did

this mean for their handwriting practice? In staffrooms, we debated. Did it matter? Was handwriting practice becoming incongruous? Then there were those students with underdeveloped fine motor skills who found keyboarding difficult. I found that during my 'Computer Immersion' trial in 1994 the attitude of reluctant writers, mainly boys, was considerably enhanced by the opportunity to redraft their text on screen, which enabled them to focus on content rather than presentation. I reported that

> [Word processing] enables students to reflect on the thinking that goes behind writing; before classroom computers were equipped with spell checkers and redrafting, both content and spelling, was encouraged and supported by conferencing. (Jordan 1997, p.4)

There was no doubt that being able to use a computer for their written work boosted some students' confidence and sense of excitement but my subsequent experience, post-1997, showed that most students were very reluctant to redraft their work because they did not have the skills to do so or they had written and were finished with the particular piece of writing. This also happens with some students when they write with pen and paper. I also wondered about the DECCD's claims when they state that word processing gives students "a new perspective on spelling and punctuation errors" (1997b, p.19), as spelling and grammar checkers are not necessarily reliable, and students need to know or recognise when spelling was correct, as incorrect or irrelevant words are often proposed. Even in the DECCD's own document for example, and ironically, using Word 2007™, the spelling and grammar checker accepted the following sentence as correct: "*Before* classroom computers equipped were with spell checkers and redrafting, both of content and spelling, encouraged was supported and by conferencing" (DECCD, 1997b, p.19). These are the exact words and arrangement that appear in the text of the literature review.

Some of my students did show an improvement in the quality of their written work. The DECCD expected this and cite Edinger (1994), who reports that simply giving each of her students access to a word processor "improved the quality of her students' writing." She explains that because the computer had made the mechanical

aspects of writing easier, students could focus “more closely on what they wanted to say” and the word processor “made them feel that they were ‘real’ writers.” Building support, the DECCD notes that Buckley (1995) also finds that providing good word processing access to students leads “to an increase in student writing, a heightened focus on revision and editing and more frequent publication of student work.” Geisert and Futrell (1990) find that word processing by students is improved when they are taught specific strategies such as “peer checking, collaborative projects, spelling checkers, thesaurus and grammar checkers” (DECCD, 1997b, p.19-23).

Even though there were potential benefits, the DECCD discover, citing Jessel (1997), that research evidence supporting the use of word processors appeared to be “somewhat lacking”, and that the early findings from research on the effects of word processing were ambiguous and somewhat contradictory. According to Bangert-Downs (1993), notes the DECCD, readers were “left suspecting that unspecified contextual features mediated the impact of word processing on writing” (1997b, p.21). Bangert-Downs also states that early research findings suffered from three problems. Firstly, students only wrote a minimal number of essays in a short time. Secondly, a number of studies only looked at the final copy after initial writing using pen and paper. Thirdly, students were often required to learn word processing skills as their work was being assessed for quality and quantity. In spite of such problems, the DECCD conclude that the evidence for the use of word processing by students suggests a very positive effect on their writing skills and on other aspects of literacy. This effect, they claim, is particularly evident when students are “explicitly taught how to use the word processor”, or when some specific software designed to help students exploit the use of the word processor is “well utilised” (DECCD, 1997b, p.23).

Often, I found it difficult to spend time with individual students to guide their keyboard skill development and show them how to use the basic features of a word processing package. Teachers were discouraged from using formal typing lessons because of the DECCD’s view that students would pick up the skills as they gradually progressed. My skills were based on the use of a typewriter and I found it very difficult to explicitly teach my students the correct way to use a word processor. Students were often frustrated and impatient and just wanted to get on with writing

their story using what they were comfortable with—pen and paper. The concept of the paperless office has come and gone. Today we are still pencilling and papering. Recently, the *Weekend Australian Magazine* (Nov. 1, 2008) reported a surge in stationery sales. It is worth noting that Heads of State and other important dignitaries sign agreements with a *Mont Blanc* pen.

The Infancy of Masses of Information

Accessing the Internet still accounts for a large amount of student time spent on computers in classrooms in 2008. This was beginning to be the case in my classroom post-1997, even though the Internet was in its infancy as access was slow and the amount of information available was very limited. As the Internet became more accessible with the improvement in technology, a considerable amount of Internet time was spent on project research and presentation. This involved library research time, using classroom books, charts and increasingly, computer access to the Internet for information. The DECCD cites Smyth (1997) and states that there are "strong arguments that the use of the Internet simply to gain access to information is a very restricted application" thus implying that new skills and ways of thinking need to be acknowledged and developed. The effective use of the Internet, claims the DECCD, involves,

> ...the development of search strategies, the learning of new techniques for critically evaluating the material retrieved and the use of other media such as books, to check, clarifies and complement the electronic material. (DECCD, 1997b, p.37)

The DECCD acknowledge that the Internet potentially opens doors to limitless information but in order for it to benefit their learning, students have to develop the necessary skills to evaluate the relevance, reliability and validity of the information in relation to the subject they are researching.

A few years later, Allan November (2001), who had some influence on the DECCD literature review and the *Computers as Tools for Teaching and Learning* (1997) documents agrees further, by saying that the Internet can provide ready access to a

wide range of information but it requires two main steps, “accessing the internet efficiently” and “interpreting the information critically” (2001, p.7). Efficient searching, he asserts, involves familiarity with, and knowing when to use known Uniform Resource Locators (URLs). URLs were to be provided by teachers, and were then available in various publications or, as in recent times, were a large part of mass media promotion. November suggests awareness of the type of source by its domain identifier enables students to distinguish commercial sites, for example *co.au* or *dot com* from government, *gov.au* , non-profit bodies *org.au* and academic sites *edu.au* or *ac.uk.*

Accuracy is still important today. Entering URLs as misspellings may cause an error message. An incomplete or incorrect address may redirect to an unexpected or inappropriate site, which occasionally happened in my classroom. I found that my primary students did not distinguish between these domain identifiers, as their searching was based on their particular topic of interest. I cannot forget one student’s panic when he typed in *whitehouse.com* instead of *whitehouse.gov* and found that he was in a pornographic web site.

I was aware that computers in the classroom provided access to a mass of information through the Internet, the flow of which I as a teacher could not personally select or control. I felt that it was important to help my students develop their critical faculties. I encouraged them to question, probe and challenge the information and its sources and consult alternative sources. Rather than reproducing information from the Internet, I wanted my students to select, interpret and analyse information from a range of sources. November (2001) expresses the need for teachers to help students develop these skills by using the Internet to promote independent learning. Teachers should assist students to identify the questions they need to answer and the sources that might help them. The students then learn to consult and evaluate the information from these sources in relation to the question being addressed. These strategies were difficult for my students to learn. While I encouraged them, reminding them that additional sources could include people, printed, audio and electronic materials as well as personal experience, I recognised that, as with previous technological initiatives, for example, radio, television, language laboratories and video, the initial approach in classrooms has often been to

‘add’ these technologies to current practices and routines.

To help move beyond these previous practices, November (2001) makes a distinction between what he describes as “automating V informating” (p. xxiv). Automating focuses on techno-centric questions such as, what technology should we buy? Where should we put it? How would we train teachers to use it? He explains that whilst this approach could lead to incremental improvement, in some cases “the quality of work actually declined.” He suggests that this is because “the work, the locus of control, the time and place and the relationships remain the same; the same processes are used to solve the same problems” (p. xxiv).

A more advanced approach, he asserts, would be “informating”, which transfers the focus of attention from the technology infrastructure to the learning activities. In this way, computers would be used to meet a learning need or enhance a learning experience rather than as an end in itself. The power of informating “lies in the shift of control and empowerment, arising from a fundamental change in the flow, control and application of information.” The flexible use of computers offers scope for “sharing work and building relationships” (November, 2001, p.23). In doing so, it “opens up the classroom to a networked learning environment for students and teachers” and, therefore, enables teachers and their students to progress from “a relatively isolated professional environment to a cooperative and collegial working culture” (p.45). This would mean that teachers will focus less on computer literacy and more on information and communications literacies. Unlike the detail offered by November (2001) in his proposals, the DECCD’s literature review lists enthusiastic possibilities stating that students,

> ...can interact with exhibits at a museum, take a ‘tour’, aim a telescope into outer space or visit cities around the world. They can find electronic pen pals or join kids in the classroom around the world...they can connect with mentors or consult with experts...and they can follow along as scientists, explorers and adventurers mount expeditions to earth’s most remote areas. (DECCD, 1997b, p.35)

This is a good example of how the DECCD's enthusiasm might have been premature.

Citing Dede in O'Neil (1995), the DECCD do acknowledge that many teachers felt "overwhelmed by how much information they were supposed to convey." If teachers saw the purpose of the Internet as "adding more information," it would make current educational problems "worse not better." Then the DECCD cite Oppenheimer (1997) who says "we need less information not more...couldn't we teach them to use what they've got before favouring them with three orders of magnitude more" (DECCD, 1997b, p.36.)? To dispute this view, the DECCD cite Stevenson (1997), who suggests that

> ...the somewhat 'Luddite' argument is sometimes advanced that information and communications technology is making available so much information that it is 'polluting' and confusing the world. Such arguments ignore the powerful ability of modern software to search and distinguish between different forms of information. Indeed one object of increasing the use of communications technology in our schools is to give students the ability to control information and the sense that they already have this ability. (DECCD, 1997b, p. 37)

As I write, in 2008, anyone can publish any version of the 'truth' on the Internet. For example, on Wikipedia you can add your version or understandings to an open-source database which is available for others to consult. It is still essential that students learn how to access, validate and understand the organisation of information on the Internet and to understand the basic 'grammar' of the Internet. Without this understanding they will be manipulated by those who do understand it. If students do not appropriate such knowledge, those who posses it might manipulate them. They would become victims of the Internet, not empowered by it.

The DECCD predicted in 1997 that the potential use of the Internet is "just beginning to be realised and this is an area which would likely see considerable development in the next few years" (p. 38). As I write in 2008, students now have

access to a myriad of information and social networking sites. Thus we can appreciate that the evidence upon which the DECCD based its enthusiasm for rolling computers into classrooms at relatively high speed was thin. The DECCD had not fully considered the consequential need by teachers for deeply critical and thoughtful analysis of educational possibilities, and helpful strategies for learning and understanding the potential dangers and ethical complexities for teachers who must introduce students to the Internet.

Chapter 6

We are Living in a Frightful Technopoly

Through the experience of the historical narrative that I have recounted and the ideas of many philosopher writers, I have found a voice that has enabled me to gain a deeper understanding of the wider social and cultural impacts of what I saw unfold within my classroom and other primary schools in Tasmania. I have expressed my disappointment that the 'winds of change' blowing across the tip of Spady's Educational Iceberg did not lead to the 'cusp' that I was hoping for; rather we have descended into Postman's Technopoly.

This is the chapter where I fully embrace Postman's notion of a loving resistance fighter. In this state, I can be morally present. I can, with fortitude; I can freely decry the absence of cultural, moral and ethical purposes of education in the DECCD's policy documents.

I ask, in the dark ages of new technologies, will our legacy be just a binary code, the two digit code 01? What will we lose?' We really must question critically the Microsoft report *Being Human: Human Computer Interaction in the Year 2020*. It is appallingly frightening when such a report claims that the boundaries between humans and computers will become blurred over the next decade.

What Will We Lose If We Don't Fight?

I hope that the understandings I have revealed add to a continuing debate about the unintended social and cultural consequences as computers and other emerging technologies continue to be introduced and widely used in Tasmanian classrooms. As I move my narrative from an historical context to the present time and into the future, I explain my new role in becoming a loving resistance fighter, one who thinks critically about which of our daily practices and beliefs might contribute to a culture of Technopoly, when tools win the battle for dominance and become the sole determinants of a culture's purpose and meaning.

We still have the challenges of Technopoly before us if we are to accept and obey without critical deliberation, the Tasmanian Government's release of its 2008 ICT *Information and Communication Technologies Communiqué* to teachers in July. The communiqué continues the same thinking that was evident in the DECCD's 1997 documents, making similar claims on behalf of the Department of Education (DoE) (the current government's structure and nomenclature to replace the DECCD). One claim, for example is,

> ICT can improve motivation, thinking and achievement across all subjects so they should be used as learning tools in all subjects. ICT enables students to construct and represent their own knowledge from the vast amounts of information, real-world and virtual environments available to them. Students operate ICT to inquire, access, reflect on and manage information, to create, generate and test ideas and to evaluate and communicate their understanding with others. ICT enables students to manipulate and create information and information products, and communicate in diverse and creative ways across the globe. (DoE, 2008, p 5)

Another is,

> Existing and emerging technologies are central to modern societies and relevant to people's work, business, home and social lives. Schools need to prepare students for the world in which they live, a world characterised by rapid technological change and global communications. ICT are vital for economic growth and development. ICT skills are highly valued throughout business and society. ICT skills and understandings are necessary for a productive and rewarding life and can play a significant part in connecting people and enhancing their wellbeing. (DoE, 2008, p 5)

A decade after the first roll-out of computers was justified by the two 1997 documents from the DECCD we see that the new communiqué advocates faith in computers to improve motivation, thinking and achievement across all learning areas in words almost identical, certainly in intent, to those in the DECCD's original

documents. As Postman (1993) says, and we might concur, there is no need in a Technopoly for justification. In this new communiqué, there is no evidence of educational or philosophical inquiry or reference to the moral consequences of computers for our society in 2008.

The Microsoft-backed report, entitled *Being Human: Human Computer Interaction in the Year 2020* (hereafter I refer to this publication as *Being Human 2020*), also published in 2008, drew from the discussions of forty-five academics from the fields of computing, science, sociology and psychology. *Being Human 2020* speculates how the development of technologies over the next decade can better reflect human values. These values include "the ideas we all hold about what is desirable in different situations, societies and cultural contexts, values which guide our actions, judgements and decisions, and are fundamental to what makes us human" (2008, p. 35). There are many of these values and ideas that we can all agree upon, "such as taking care of loved ones, being active and healthy, and developing and maintaining friendships" (p. 35).

> Whether technology helps us in attaining what we desire in our lives or not, there is no doubt it affects the ways in which we pursue our goals and aspirations, and the ways in which we see ourselves and others. We propose that 'being human' in our relationship with technology means that we need to bring to the fore and better understand human values and make them central to how we understand and design for a changing world. (*Being Human*, 2008, 2020, p. 36)

> The question persists, and indeed grows, whether the computer will make it easier or harder for human beings to know who they really are, to identify their real problems, to respond more fully to beauty, to place adequate value on life, and to make their world safer than it now is.

> Computers will be able to anticipate what we want from them, which will require new rules about our relationships with machines. It is about how we anticipate the uses of technology

> rather than being reactive. Currently the human is not considered part of the process. Without proper consideration and control it is possible that we both individually and collectively may no longer be in control of ourselves, or the world around us. (p. 35)

The boundaries between humans and computers, the report asserts, will become blurred over the next decade as devices are embedded in objects, in our clothing, or, in the case of medical monitoring, in our bodies. The future will be a "double-edged sword", in an era of so-called "hyper-connectivity"; there will be a growth in "techno-dependency", creating a growing "intimacy between humans and computers" (*Being Human 2020,* 2008, p. 36).

Being Human 2020 points out that the implication for schools includes not just teaching students about how computers and applications work but about their wider impact, and lists five major transformations which, the report claims, are "irrevocably altering the relationship" we have with computers in our daily lives and as a wider society. (p. 36).

The first transformation is that computing no longer has a single interface where we would expect to be connected to printers or faxes, but rather many different ones with computers encroaching ever more on our own personal space, even being embedded, embodied, within us making old notions of the 'interface' obsolete. What an interface might be, where it is, what it allows a user to do, even whether there is an interface at all are now questions for future technologies. What is the quote here? (*Being Human 2020*, 2008, p. 34)

The second transformation, **"**the growth of techno-dependency", is that computing today underpins almost every aspect of our lives, from shopping to travel, from work to medicine. At the same time, computers are becoming more sophisticated and autonomous in their function, increasing our reliance on them, bringing changes in how we live with and use technology, which has resulted in us becoming ever more dependent upon computing. (*Being Human 2020*, 2008, p. 34)

"The growth of hyper-connectivity", the third transformation, reflects the increasing importance of communication technologies in our private and public lives, tying us together in new and different ways. We find it easier and quicker to email one another rather than write a handwritten letter and it is anticipated that into the future we will spend more time, and devote more effort, to being in touch with each other. Digital connectivity also has the power to mobilise crowds and respond to events in global ways, clearly demonstrated in protest events in recent years. (*Being Human 2020*, 2008, p. 35)

"The end of the ephemeral", the fourth claim to transformation, refers to the changing nature of what and how and why we record and store information. This is happening at a personal level, and also at the level of government, institutions and agencies. (*Being Human 2020*, 2008, p. 35)

And the fifth claim, "the growth of creative engagement" happens through a proliferation of new digital tools. People from all walks of life will appropriate them. The new digital tools will affect all of us and enable us to work, play and express ourselves in new ways. (*Being Human 2020*, 2008, p. 35)

Each of these five transformations, the report claims, impacts on the way we view interaction and design, and raises far-reaching questions for us all. In the face of all this change though, some important things will remain the same. Above all, *Being Human 2020* claims,

> ... the characteristics that make us essentially human will continue to be manifest in our relationship with technology. People will still wish to be part of families, to stay connected with friends, to educate their children, to care for each other when they are unwell, and to grow old safely and in comfort. Technology, digital or otherwise, is the enabler for all of these things rather than the focus. Shifts in computing are therefore not at the forefront of people's concerns. What does concern them is how technologies can support the things that matter to them in their daily lives, the things they value. (*Being Human 2020*, 2008, p. 36)

I have shown in my thesis that the very nature of being human may not be compatible with this prophetic and scary view of the place of technology in our lives, and that we must ask ourselves whether we over-value the place of technology in our lives generally, especially whether we over-value computers in schools. Are we not seeing in Microsoft's *Being Human 2020,* a well-illustrated version of Postman's Technopoly? We are not only controlled by machines, we are expected to form human relationships with them. Will machines be able to tell us what it means to be human? Share our emotions, values and beliefs with us in human, intimate ways? Is this how far Microsoft is prepared to go? It beggars belief.

The Loving Resistance Fighter

For Postman, the loving resistance fighter must be prepared to be asked: "What is the solution to the problems you describe"? Postman notes that the problem of living in a developing Technopoly can be divided into two parts: "what the individual can do irrespective of what the culture is doing; and what the culture can do irrespective of what any individual is doing" (Postman, 1993, p.182). Of the first, he says, "no one is an expert on how to live a life." Instead he suggests, to defend against the worst effects of Technopoly, "is to try and become a loving resistance fighter" by which he means,

> ...in spite of the confusion, errors, and stupidities you see around you, you must always keep close to your heart the narratives and symbols that once made the United States the hope of the world and that they may yet have enough vitality to do so again. Can a nation preserve its history, originality, and humanity by submitting itself totally to the sovereignty of a technological thought-world? (Postman, 1993, pp.182-183)

"Resistance fighters", asserts Postman, are people who resist Technopoly by refusing to accept "efficiency as the pre-eminent goal of human relations," who free themselves from the belief in "the magical powers of numbers," who do not regard calculation as an "adequate substitute for judgement, or precision as a synonym for truth," who are, at least, suspicious of the idea of progress, and who do not confuse

information with understanding. The loving resistance fighter admires technological "ingenuity and achievement" but does not see it as representing the "highest possible form of human achievement," and does not believe that science is the only system of thought capable of "producing truth". In short, a technological resistance fighter maintains an "epistemological and psychic distance from any technology, so that it always appears somewhat strange, never inevitable, never natural" (Postman, 1993, pp.184-185).

As I come towards the end of my thesis, and to the point of releasing myself from the oppression I could allow myself to feel living, as I do, in a state of Technopoly and as a teacher, a player, on a stage that is not of my own making, I perceive a role and identity for me, to be a loving resistance fighter, one to which I am willing to commit, morally and intelligently. I refuse to accept efficiency as the pre-eminent goal of human relations; I attempt always to free myself from believing in the magic of numbers; I do not regard calculation of 'right' answers as replacement for good, human judgement; I am suspicious of the idea of progress; and I continually seek ways to avoid confusing information with understanding. I admire technological ingenuity and achievement but not as the highest possible form of human achievement. Neither do I have complete confidence that science or precision produces 'truth'.

I find it is for me to question and ask whether technology should ever be accepted as part of the natural order of things and understand that every technology from an IQ test to a car, television set to a computer, is a product of particular economic and political contexts. I am to speak out that technologies could also carry with them a program, an agenda, and an ideology that may or may not be life-enhancing and therefore require scrutiny and criticism.

Such scrutiny and criticism were missing in the advocacy published by the DECCD. In the documents I have examined, the DECCD seem to miss the awareness, thought and discipline of greater minds, such as scientists, philosophers and others who comment on the political, social and cultural events in human lives.

Paulo Freire, who devoted his life to freedom, resistance and love for humanity, understood that the struggle of teachers to exercise their political will and capacity to decide within schools is severely curtailed by the tendency to become hardened by the "dominant bureaucracy's dehumanising posture towards teachers who seek to change." He speaks to us still, posthumously, through the work of Antonia Darder, and tells us that it is imperative that teachers and students "strive to unveil and challenge the contradictions of educational policies and practices that objectify and dehumanise us, preventing our political expression as full subjects of history" (Darder, 2002, p.55).

We are living in a Technopoly. We are still introducing computers and other popular technologies into classrooms without considering the philosophical and educational consequences. One poignant, recent example, reported by Mark Worley in the *Sunday Tasmanian*, (February 22nd, 2009), is the event in which a local, all boys' private school recently announced a new "electronic devices policy", in order to encourage staff and students to use "modern technology" in class. Students download class podcasts on iPhones and iPods, take photos with phones for science projects, and use devices for recording audio-visual diaries for humanities subjects. The school principal said, as Worley reported,

> ...the school's policy allows teachers to stay connected with the switched-on generation... we want our students to embrace new technology. These new little machines are more like computers and have uses which are suitable for certain classes... I think that most teachers know that we need to be able to get students' attention, and keeping up with technology is a good way of doing that… [The school] is trying to prepare its students for the real world, by making them realise their personal lives can be made very public online.

Year by year, the same arguments present themselves to the public in newspapers and system and school policy documents. How ought we to live as caring resistance fighters in this age of Technopoly? I offer this historical, narrative inquiry as a means of thickening, or deepening, the questions we have to ask, and the deliberation

we ought to participate in, about the consequences of using high technologies in our classrooms. I offer this as the way of a loving and caring agent of resistance who finds ways to act against the worst effects of Technopoly by honouring the narratives of humanity, and to defend against the possible hegemony of technology in our social and cultural worlds.

I believe that in 1997, a deeper inquiry, revealing thoughtfully described and appreciated philosophical, theoretical and educational perspectives, ought to have been commissioned responsibly by the DECCD. Instead, to justify its computer roll-out, a thin literature review was considered sufficient. Postman and others warn of the dangers of such superficiality and the possible consequences for our philosophical understandings of what it means to be a human being. Here in my thesis, I have also warned of such dangers. So, in writing this, perhaps I have been able to release myself from the complicity, compromise, and responsibility of the position that I was once forced to take during my paid years as a teacher.

Poesis and Technology

In 1966 it is fascinating that the *Being Human2020* cites from a book called the *Poet and the Computer,* by Norman Cousins. Is the citation meant to soothe our fears? Does Microsoft want us to think computers will make it easier for us to live more fully in the world? At this moment of writing it strikes me that what we might be losing is the poetry of life, the *eros*, the passion for meaning and being human.

Poesis is a Greek term which means bringing into being, to create something Could it have been in the spirit of *poesis* that inventors brought computers into our world? If we are at the receiving end, consumers for whatever purpose, we are perhaps denied the capacity of *poesis* as our human right.

> The question persists and indeed grows whether the computer will make it easier or harder for human beings to know who they really are, to identify their real problems, to respond more fully to beauty, to place adequate value on life, and to make their world

> safer than it now is. (Norman Cousins, 1966, *The Poet and the Computer*, Cited in Being Human 2020, 2008, p. 3

To continue, will the computer make it easier for us to comprehend human experiences to bring questions and thoughts into language?

Computer technologies have created certain changes in our schools, in our communities, and in wider society, in virtually all aspects of our lives. What will our world be like in 2020, as digital technologies are predicted to proliferate and change how we live? Will such developments improve our quality of life, empower us, and make us feel safer, happier and more connected? Or will living with technology make our lives more frustrating, detached and security-driven? What will it mean to be human when everything we do is supported or augmented by technology? What role should researchers, designers and computer programmers have in shaping our future? I propose we consider both the positive and negative aspects of these questions because, on the one hand, we use technology to pursue healthier and more enjoyable lifestyles, expand our creative skills, and instantly gain access to information never before available; on the other, governments are becoming more reliant on computers to control society, criminals are becoming more adept via digital means, and people are worrying more about what personal and private information is stored about them.

According to the Microsoft Report, *Being Human 2020*, more people than ever will be using computing devices of one form or other; technology will continue to have an important impact at all stages of our lives. Does this mean that the way we grow up, live together as well as what it means to learn, to be a family, to be healthy and active in old age will be inextricably entwined with computers, whether we like it or not?

The nature of learning is changing significantly as more and more technologies are assimilated into our lives. For example, *how* learning happens, whether taking part in a discussion with people from all over the world, and *when* it happens, listening to a podcast whenever it is convenient for us to do so. There are more opportunities through which we can access, create and share content with others. The nature of

teaching has changed, both in terms of how teaching is undertaken and in how it is measured. For example, the way teachers engage with their students during class, using computers or online assessment to provide feedback and reports, is very different from the 'chalk and talk' model of the past. What will learning be like in 2020? Will exercise books and report cards of today even be recognisable? Or will it be computers that will be put into cupboards? We have created a diverse range of technologies for educational purposes, from multi-media learning to mobile measuring and sensing equipment. Interactive whiteboards and Wi-Fi are also becoming more commonplace in schools. As the cost of computers fall, will our schools continue to be flooded with them? Will we accept that human relationships are what really count? And how teachers and their students use computers in a learning context is what is important? This means understanding the educational and philosophical purposes of technology as discussed in my thesis.

We do not need to always be journeymen: as workers in a Theocracy, where tools were invented and used and integrated into the society in ways that did not significantly contradict the society's ideology; or in a Technocracy where tools play a central role in the 'thought-world' of the culture: everything must give way in some degree, to their development, or indeed, in Technopoly, where what cannot be measured either does not exist or is of no value; and the affairs of citizens are best guided and conducted by experts.

We have more to do than drag the weight of part of the iceberg that Postman's three cultures have submerged. We can continue walking backwards, gazing back to our achievements in the past with the prospect of a future at our backs, or we can make the 180 degree turn on the cusp of the past and future, towards the present and the question at the peak of the mountain. We can be amongst those loving resistance fighters who put their inner moral strength against the prospect of a dark frightening age that Technopoly could bring.

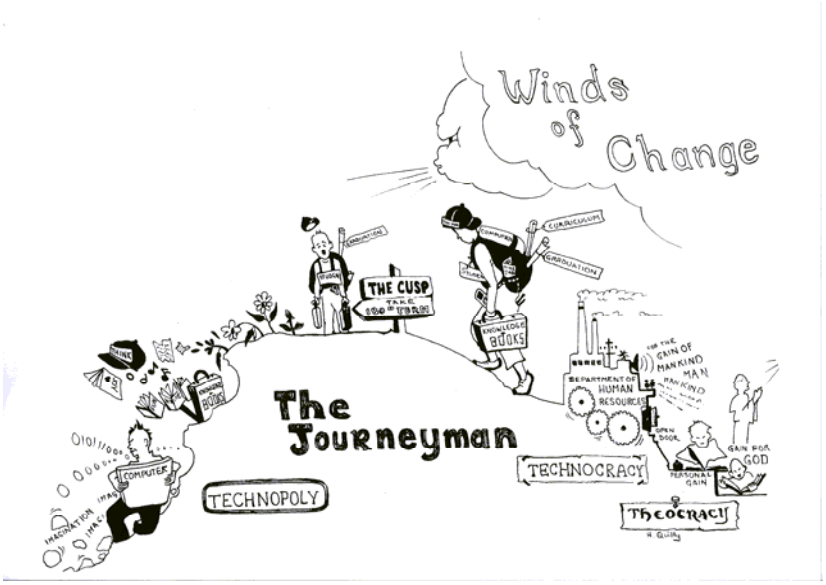

Figure 2. Helen Quilty 2009

In what ways do we defend against falling into the darkness of digital ages, as our information storage systems become outdated? What is being left behind as we continually upgrade? What do we cull? Who decides what gets passed on? Will it depend on the ease of transfer of information or the cost? What will be lost or dropped off on the way? What of our artwork, books, paintings, photographs and dozens of types of cultural artefacts that are not digitally formed? If they disappear, we are indeed left in the dark. Resources like Wikipedia, Word™ and PowerPoint™ are becoming second nature to most students, and this is the way students are learning to create, solve problems, express themselves and understand the world. Will the new generations of teachers, who grow up with computers, increasingly incorporate high-tech into their practice without a second thought or without developing critical or moral perspective about their purpose as teachers? As loving resistance fighters we must speak and write our resistance with understanding, impunity and compassion and also express our fears with measured, argued deliberation.

As computers become even more pervasive, how we humans interact with them is a crucial issue for society. ‘Being human’ is not simply a label; it is about a set of aspirations and values. Recognising these aspirations and values, and striving to realise them, can make the world we live in one to celebrate rather than fear. We

have moved from the ages where our ideologies and social systems determined the use of tools; now the use of technologies significantly influences our social systems, as well as our perceptions of what and who we are.

Philosophical questions are important. For example, our concepts of how the mind works will affect the way we design technologies to support memory, intelligence and much more besides. We need to participate in an empirical, philosophical and moral investigation of *why* computer technology has a role in our schools. And this entails asking new questions about how we ought to interact with technology now and into the future. It entails asking what the use of computing in schools implies about our conceptions of society.

I will continue to be a participant in this conversation as a teacher, a researcher, a loving resistance fighter, seeking a deeper understanding, having something to say about an issue that is meaningful, significant, and important to my sense of what it means to be a human being. As a loving resistance fighter I will ask in a non-violent, unaggressive way, gently and searching: “What about this, is it a problem? Should we worry about computers in schools”?

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Appendix 1

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