# DIGITAL RHETORICS: LITERACIES AND TECHNOLOGIES IN EDUCATION — CURRENT PRACTICES AND FUTURE DIRECTIONS

## VOLUME ONE

## Overview of the Project

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# A GUIDE TO THE READER

This report presents the findings and conclusions from a two year study of the interaction and relationship between literacy and technology in teaching and learning, primarily in school education. Specifically, the report contains:

- an investigation of technology and literacy practices in various learning contexts;
- a conceptual and theoretical account that informs our approach to this study and the recommendations advanced;
- a study of some key policy documents impacting upon teaching and learning in literacy, language and technology.

The report comprises three volumes which have been written to stand alone or be read together.

Recommendations derived from the study as a whole appear in Volume One, and are intended to inform educational systems, curriculum developers, school administrators, teachers, and parents.

We have aimed throughout to stay as close as possible to practical educational issues, guided by a set of conceptual and theoretical ideas, and informed by empirical investigations of a range of educational sites. It is hoped this report will generate debate, provide directions for further research, and indicate possibilities and principles for professional development.

# VOLUME ONE

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# Chapter One

# AN INTRODUCTION TO THE PROJECT

This report presents the findings and conclusions from a two year study of the interaction and relationship between literacy and technology in teaching and learning, primarily in school education. Our work has focused largely on three elements: a study of policy documents impacting on teaching and learning in literacy, language and technology (Volume 1); an investigation of technology and literacy practice in various learning contexts (Volumes 2 and 3); and a theoretical account that informs both our approach to this study and the recommendations resulting from the investigations (Volume 1).

The project was conducted collaboratively by a research consortium with members originating in Queensland, New South Wales, Victoria, and Western Australia. It was funded by the Commonwealth Department of Education, Employment, and Youth Affairs, through the Children's Literacy National Projects Programme.

Our aim in this report is to provide means by which educators might understand more clearly and fruitfully the relationship between literacy and technology, and how they might develop this relationship pedagogically within English, Technology, and across the curriculum. We expect that insights and recommendations generated by the project will contribute to more effective and powerful literacy practices, within classroom and out-of-school settings alike.

## *Background*

Our work in this project needs to be seen in the context of escalating and changing demands for literacy and technology learning worldwide. The rapid and far-reaching technological advances of post-industrialism and the associated shifts in employment patterns have prompted calls for a society and workforce able to cope with the new demands of work and life in these changed and changing times. Some argue that "higher order" literacies and understandings be much more widely distributed among populations than ever before. Others emphasise a return to "basics" while yet others argue for the importance of critical literacies in a world which has become shaped by advances in computer and communication technologies. In this climate, there is no shortage of conflicting and confusing advice for teachers and schools.

As has been the case in prior periods of high unemployment and social dislocation, education is identified as contributing to the problems associated with widespread and rapid social change and hence, also being an important means of tackling these problems, if it can be made to provide new and appropriate skills and understandings (Seddon, 1994). What up to this period of change had been regarded as a curriculum problem, (i.e., what should schools teach), has been subsumed in larger national debates concerned with the promotion of flexibility and adaptability in

Australia's workforce (Watkins, 1991). What schools teach and how they should respond to changed and changing circumstances can be represented as a gap that exists between what key agents in "the larger cultural context" and key agents with respect to "classroom curriculum" see as important in social, cultural and historical terms (Healy, 1996). This gap can largely be defined by reference to practices in, approaches to and understandings of, technologies andliteracies.

The technologies that are marked as most significant in their structuring of Australia's workforce and social structures, are the so-called new information and communication technologies. The literacies that are argued to be important in the changing of Australia are less clear and potentially include the importance of mastering new ideas, of reading, writing and comprehending, in the traditional sense, but now also including skills in the visual media associated with most technological applications.

## *Aims and objectives*

The project called for investigating relationships between literacy and technology as areas of learning and across the curriculum, as well as to explore the impact of technology on the nature, definitions and views of literacy. We framed a range of desirable objectives for the project as follows:

- to frame a model or models for teaching and learning new literacies in English and Technology and across other curriculum areas;
- to explore technologies, technology-mediated processes, and technological environments that generate newliteracies, and to describe such literacies;
- to identify how teachers, students, and others perceive literacy and technology and their relationship;
- to examine the relationship between literacy and technology in the learning areas of English and Technology, as well as in other learning areas;
- to provide recommendations for future policy directions in teaching literacy and technology.

Given the vast scope of these objectives it was necessary to refine them in terms of outcomes sought from the project.

## *Outcomes*

This report documents our pursuit of the following outcomes:

- an account of research and theory—largely presented as a conceptual and theoretical statement—in a form that is useful for teachers, policy developers, curriculum planners, and other educators;

- accounts of "technology" for the purposes of classroom study across key learning areas;
- an analysis of how technology is currently being perceived and employed within the English learning area;
- an account of how literacy is perceived and employed within the Technology learning area;
- an examination of "technological literacy" within particular school subjects;
- an account of technology and literacy across the curriculum within current practices covering exemplary[1] and typical cases, and identifying underlying perceptions, beliefs, values and purposes;
- an account of how technology and literacy might be perceived and developed in subject areas in pursuit of effective practices in line with policy goals and desirable future directions—including professional development work;
- a set of recommendations framed with the intention of providing an informed basis for future curriculum policy, program development, teacher education, and professional development programs at the interface of literacy and technology.

## *Ways of working*

This was an interesting project to work within. For many members of the group, it was the first large scale research project they had been involved with, that had its principal investigators distributed widely over four states of Australia. There were distinct advantages to convening a group that comprised seven academics representing six Australian universities, a member of a state education authority and two research assistants, both students working in the field. These advantages are to be seen most clearly in the depth, coverage and diversity of the completed report.

From the time when this project was first conceived, members of the team were each invited to work in the project to broaden the collective expertise and experience, and particularly in two main thrusts of the proposed research—language and literacy, and information technologies education. The work of the team was, towards the end of the lifespan of the project, supplemented by four commissioned and specialised studies, enabling the project team to expand the horizons of the completed report.

Of course, the success of a collaborative project largely depends on the extent of the collaboration. Collaboration was no doubt strongest in our face-to-face deliberations, over four team weekend (three day) meetings, at Queensland University of Technology, during the two-year project. This collaboration was then reinforced by both planned and adhoc meetings between fewer members of the group; and by

[1] It is important to clarify here, that by exemplary we do *not* mean "best practice", or "exemplary" in the sense of being optimal, ideal, or worthy of emulation—although there are certainly a number of "exemplary" elements of practice in this sense, to be found in the reports of many site studies (Volume 2). Further discussion of what we mean by exemplary, can be found later in this introduction.

whole-team teleconferences, held on four occasions, set to deal with gaps in our other communications and to "push" towards deadlines, both self-imposed and those set by the project advisory group. Throughout the project term, the team also worked with two on-line, asynchronous, discussion groups—one of these was reserved for team members; the other for the project advisory group, team members and invited "others". The first of these was initiated largely to carry discussion and ongoing deliberations of team members, in lieu of more regular face-to-face meetings. However, the latter served more to flatten and distribute our work and indeed, our workload, rather than enrich it, and in this sense, contrasted vividly with our non-electronic meetings which, particularly in the first part of the project, did much to build a very strong conceptual framework to the project. Interestingly, the nature of the collaboration using just the type of technologies we were concerned to investigate, holds key lessons not only for others embarking on similar distributive and collaborative research ventures, but in relation to the ways in which academics employ new communication technologies to advantage the products and processes of their endeavours. These lessons will be told, but in a forum other than this report.

## *Methods*

The focus of our empirical research comprised 11 units of study, where each unit is an holistic and self-defining entity—a site. Sites were purposefully selected to reflect a real-world diversity in literacy, language and technology learning, in schools and elsewhere. The site, as a unit of study, is a methodological construct analogous to Patton's units of analysis, a construct commonly applied in qualitative research designs to describe individual, unique and special foci for data collection and analysis (Patton, 1990).

Our site studies have been approached, methodologically, as case studies, where the interest is in investigating a range of critical practices in which literacies and technologies interact, and that are of value for what they reveal about the ways in which a particular case or site, operates. Unlike traditional case study methodology, however, which is usually focused on an in-depth investigation of a single and well-defined unit of analysis (Merriam, 1988), our focus on sites rather than cases enables fluidity in moving the research focus around or across environments or actors occurring within an environment. So, for example, where an original site focus was on a whole classroom, it might have become more telling to later shift that focus onto a teacher or particular group of students. In this sense, one site study in our study might take in more than one "case".

From these site studies we are able to produce a patchwork quilt detailing the diverse models and circumstances that colour current practice, and importantly, provide us with well-grounded data to infer directions in which these practices are likely to move in future years.

The investigating team consciously employed diverse means in both selecting the range of sites, and in collecting data from them—indeed, the range of data collected necessarily differs across our sites, since the sites themselves differ widely,

encompassing subject departments in high schools, individual teachers, cultural groups, primary classes, listserv communities, learning "centres" and a university faculty. However, there is also a coherent and unifying level of contextual data collected—these data afford descriptions of each of the sites in terms of physical and organisational structures, geographical space, participants and resources.

The output of our empirical work takes the form of narrative—descriptive and analytical stories that reflect the sense of immersion experienced by participating in each of the sites. The methodology of the study has been guided by a series of interconnected themes and strategies—these include naturalistic enquiry, holisticism and inductive analysis (Patton, 1990, p. 40), (see Table 1).

***Table 1. Methodological themes***

| Methodological themes | Characteristics |
|---|---|
| Naturalistic enquiry | Understanding of the real–world, dynamic, nature of the sites as educational settings;<br>Each site is studied without manipulating its natural setting. |
| Holistic perspective | Study of the whole site, rather than a study of single or multiple variables in that research setting. |
| Inductive analysis | Using research questions and themes to guide the research study rather than to constrict findings;<br>Exploring data collected to induce interconnectedness, meaning and relationships. |
| Case orientation | It is assumed that each of the sites is, in the first instance, unique and special, and that data collection is for each research site alone;<br>Analysis across sites follows only after each case has been saturated in data, and meaning has been induced for that site. |
| Insight | Each researcher brings to bear his/her own insight, experiences and feelings to help build a critical understanding of the data collected, at the point of collection. |
| Participant observation | Each researcher participating in the site studies, helps build an understanding of a site through the data collected– an understanding that cannot be arrived at simply through the views and insights of others (i.e., the research 'subjects'), (Becker & Geer, 1970, p. 133) |

## *Data collection and analysis*

We have used a range of instruments and structures for collecting:

- contextual or background data;
- artefacts (e.g., policy documents and statements at multiple levels);
- interview data;
- observational data.

Instruments were developed to suit a diverse selection of sites; and each site was not subjected to the implementation of all instruments. Essentially, we aimed to provide for information-rich cases, employing a range of sampling techniques and strategies to provide for saturation (Glaser & Strauss, 1967, p. 67). It is in the richness and diversity of the studies, taken collectively, that give the resulting narratives meaning.

In fundamental terms, the task of analysis in this project, was to make sense of a range of disparate data, to reduce the amount of information and to identify significant patterns which can then be communicated within and by narrative. Miles and Huberman suggest that there are "few agreed-on canons for qualitative data analysis, in the sense of shared ground rules for drawing conclusions and verifying their sturdiness" (1984, p. 16). It is in this context that a range of guidelines were drawn up for analysing data that arose in the application of each instrument; although, essentially, we have employed a number of recognised approaches for conducting attributional, content, case, inductive and phenomenological analyses (Patton, 1990).

## *Trustworthiness of data and findings*

So far as possible we "triangulated" data from different collection *sources*—policy documents and other artefacts, interview material, observations—and across different episodes within single sites and between different sites. Consistencies across these variables increased our confidence in the data collected. We also checked our data-based descriptions against diverse reports of research collected by other people in other contexts as a test of likely authenticity and reliability. Most importantly, we ran very rigorous 'member checks' (Lincoln & Guba, 1990) on our descriptions and handling of the data, eliciting forthright and, in many cases, detailed responses from participants. These were taken very seriously into account in the final rewrites. Where there was genuine difference in interpretation we erred in favour of the participants' views.

Even so, we were not attempting to report genuine ethnographic accounts of the site-based practices. Our main concern was to make *theorised* sense of what we saw. What is important are the implications of our descriptions for achieving the kinds of practices we believe are worthwhile for schools to pursue. In this way, the correspondence between the sense that participants make of their practice and the sense we make of it is less important than the "lessons to be learned" from subjecting descriptions of events, processes, and episodes to theoretically informed ideals.

## *Sites*

*Range of sites*

Classroom based sites investigated were located in three states: Victoria, New South Wales and Queensland. A range of geographical locations were covered, including inner city suburbs, outer city suburbs, satellite cities, regional towns, and small towns in isolated rural areas. Both primary and secondary schools were included in site studies, and attempts were made to describe classrooms from all levels of schooling, from lower primary through to upper secondary. Some of the site studies cover more than one school: for example, BushNet investigates a number of schools that are connected through the BushNet electronic network, and another study investigates three schools that are connected through common interactions with an educational adviser. Most schools belong to the various state systems, while one private school was also included. Key learning areas covered in varying degrees were English, Technology, Studies of Society and the Environment, Science, Maths, and The Arts.

Three procedures have been used in naming the site studies. Most employed pseudonyms for schools. In one case, BushNet: Uneven potential, permission was received to use the names of the schools involved in this network. Other studies have employed a theme in the title. With the exception of BushNet: Uneven potential, all personal names in the site studies are pseudonyms.

*Site study categories.*

Part of the original project brief was to investigate schools from a range of areas. We drew up a list of categories and, during our site selection phase, attempted to select schools that would cover all of these categories. The categories and site studies are listed below.

***Table 2. Classroom based site studies***

| Site | State | Level | Band | City / Rural | Type | KLA |
|---|---|---|---|---|---|---|
| **Abbotsdale: Theory informed practice in a Year 5 classroom** | Qld | P | UP | Rural | State | English<br>Mathematics<br>Science<br>The Arts |
| **BushNet Schools - Uneven potential** | Qld | P S | UP<br>LS | Rural | State | English<br>Technology |
| **Castleton: Computer basics makes for competent, confident Year One students** | NSW | P | LP | City | State | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Ealing Grammar - A site of computer integration** | Vic | S | LS | City | Private | English |
| **Elmwood: Technology in transition as a key learning area** | Qld | S | LS | City | State | Technology |
| **Facing the challenge in a rural remote region.** | Qld | P S | UP LS | Rural | State | English Technology SOSE |
| **In splendid isolation: Caldwell Primary School** | NSW | P | LP UP | Rural | State | English |
| **Multimedia support for multicultural students at Carlisle Primary School.** | NSW | P | LP UP | City | State | |
| **New Park Primary** | Vic | P | LP | City | State | English |
| **New technologies, old timetables: The difficulties of embedding computer use across the high school curriculum** | NSW | S | LS US | City | State | English |
| **Spur Primary School: Melding the old with the new** | NSW | P | LP UP | Rural | State | English |

**Key**

State: Qld (Queensland); Vic (Victoria); NSW (New South Wales)
Level: P (Primary); S (Secondary)
Band: UP (Upper Primary); LP (Lower Primary); LS (Lower Secondary); US (Upper Secondary)
Type: State or Private funding
Key Learning Area: SOSE (Study of Society and Environment)

*Exemplars*

The purpose of the site studies is in part to identify and describe a range of exemplars which will provide an informed basis for judgments about what is currently going on (and not going on) in educational contexts with respect to new technologies and learning, especially in the areas of language and literacy. In addition, the site studies were designed to provide information about the range and diversity of current practices, particularly in relation to relevant policy, curriculum and learning outcomes statements. Finally, we investigated sites to expressly provide an empirical base for advancing strong and cogent recommendations for future policy directions, research and development, and effective pedagogy.

It is important to clarify at the outset what we mean by exemplars. In particular we do *not* mean "best practice", or "exemplary" in the sense of being optimal, ideal, or worthy of emulation—although there are certainly a number of "exemplary" elements of practice in this sense, to be found in the reports of many site studies (Volume 2). We quickly recognised that to make sound and useful recommendations would not be a matter of simply finding model instances and exhorting the profession at large to go and do likewise. It is more a case of identifying existing strengths that can be built upon, and current impediments or snags which can be addressed, within strategies for enhancing future practice. For many, it will be the "trouble spots", sources of frustration, and diagnoses of difficulties, that will provide important clues to matters that policies, program initiatives, funding and professional development should be addressing strategically.

For us, then, exemplars are informative and illuminating examples of what is actually going on in everyday learning on an everyday basis, across a range of circumstances, policy contexts, resourcing arrangements, professional knowledge, etc. They are examples we can learn from in rich and productive ways. Exemplars direct our attention to processes and factors at all levels of the education system: from policy and provision, to pedagogy and professional knowledge.

*Organisation of site studies*

A template was developed to frame the writing of the site studies:

- *The study at a glance*: a brief abstract of the study which includes key points and issues considered.
- *The site*: a description of the characteristics of the site, including geographical location, socio–economic status and physical description.
- *The policy context*: a description of artefacts related to the study, including school policy documents, and the relationship between observed practice and the nature of these artefacts.
- *The practice*: key features of observed practice.
- *Distinctive features*: those elements of the site study that are "exemplary".
- *Issues and implications* the issues that arise for the researcher(s), identified during and after the investigation, and informed by the previous sections, and the implications for policy development, pedagogical practice, and/or further research.

Recommendations developed from each site study have been collected, collated, and summarised along with recommendations from other components of the report. A set of recommendations derived from this exercise are presented in the fifth chapter of this volume.

## ORGANISATION OF THE REPORT

The three volumes of the report have been written to stand alone or be read together, according to reader interests. Contents of the respective volumes are as follows.

## VOLUME ONE: OVERVIEW OF THE PROJECT

A Guide to the Reader
Chapter One: An introduction to the project
Chapter Two: Some conceptual and theoretical considerations
Chapter Three: School site studies of literacy, technology and learning
Chapter Four: The Australian policy environment; description and analysis
Chapter Five: Recommendations
References

## VOLUME TWO: SITE STUDIES

A Guide to the Reader
Introduction to Volume Two
School Site studies

- Abbotsdale: Theory informed practice in a Year 5 classroom
- BushNet Schools - Uneven potential
- Castleton: Computer basics make for competent, confident Year 1 students
- Ealing Grammar - A site of computer integration
- Elmwood: Technology in transition as a key learning area
- Facing the challenge in a remote rural region
- In Splendid Isolation: Caldwell Primary School
- Multimedia support for multicultural students at Carlisle Primary School
- New Park Primary
- New technologies, old timetables: The difficulties of embedding computer use across the high school curriculum
- Spur Primary School: Melding the old with the new

Conclusion
References

## VOLUME THREE: ISSUES AND INNOVATIONS

A Guide to the Reader
Introduction to Volume Three

### Part One

Oz-Teachers and UK-Schools: The anatomy of practice in the use oflistservs
New technologies in language and literacy teacher education
Technology in a critical literacy curriculum
Some options in professional development
The future of technology and literacy teaching in primary learning situations and contexts.

### Part Two

**A NOTE ON VOLUME THREE**

The bulk of the work reported in this Executive Summary is contained in Volumes One and Two. Volume Three presents a range of studies and papers designed to enrich the investigation of our main focus - conventional classrooms - and to expand the discussion of theory, concepts, and policy in Volume One. Four papers provide non classroom-based site studies: the first studies two listservs (email discussion lists used by teachers in Australia and Britain); the second investigates components of programs in a teacher education faculty; the third describes a case of curriculum planning to integrate electronic technologies into units of work on critical literacy; and the fourth is a discussion of some existing options in teacher professional development. These studies are followed by a 'scenario building' exercise with a group of participants, including teacher educators, on the issue of future uses of new technologies within primary school language and literacy. The remaining papers were commissioned: two address questions of access and credibility in cyberspace and the quality and status of information on the Internet; one describes a human network within a private school; and the last paper describes a community-based multi media space.

# Chapter Two

# SOME CONCEPTUAL AND THEORETICAL CONSIDERATIONS

## *Introduction*

This study builds on three central concepts: literacy, technology, and learning. Elucidating these faces two immediate challenges. The first is that while the three terms are very common within everyday thinking and usage, they are understood in very different ways by different people—both at the level of ordinary language use and at the level of more technical and specialised application. The second is that they are often thought and spoken about in their own right, separately from one another as well as from other important related concepts. Yet, we know that all such concepts are never self-contained "islands unto themselves" but, rather, are always defined in relation to other concepts—including, very importantly, each of the others within this current set. Our task here is to make decisions about how we will frame these concepts, in their own terms (or in their own "right") as well as in relation to each other. This is not straightforward.

A further difficulty must be acknowledged and faced: namely, that our three key concepts are highly contested. They are not concepts like "triangle", "stanza" or "kilometre"—or even like "shape" or "distance"—where we can count on a fair degree of common agreement and some kind of objectivity. Even though these latter concepts—like all concepts—presuppose some kind of world view, considerations of interests, and discursive tension, this is nothing like what is at stake with concepts like "literacy", "technology" and "learning". These, rather, are intensely value-laden concepts; heavily contaminated by what people differently aspire to and hold important or valuable. Hence, any account we come up with is unlikely to meet with anything like universal agreement. Indeed, in the various sites we investigated, and the myriad policy documents and wider literature we consulted, we constantly found these concepts to be highly contested. Different people understood them in different and, often, radically different ways.

From one perspective, this is an occupational hazard. It calls for presenting a point of view, arguing for it, being prepared subsequently to defend it (or amend it), and to trust to the larger work we produce in the study to demonstrate its usefulness. From another perspective, however, it is a privileged opportunity—a chance to enact the obligations of educational leadership and to seek to be persuasive and influential within the context of some of the most important educational debates of our times. Winning a competitive research contract carries a duty to make more widely available what we believe and claim to know and understand, and to advance it forthrightly as a viewpoint worthy of influencing future educational work. Hence, our conceptual and theoretical account is advanced as a basis for a "vision" we hope will guide future directions in policy development and implementation, school-based planning and programming, educational pedagogy—whether in schools or elsewhere—and future

research and development initiatives.

The broad approach we take here may be described as sociocultural. We will be concerned with elucidating "literacy", technology" and "learning" in relation to social and cultural practices: in their own right as literacy practice(s), technology or technological practice(s), learning practice(s), and as interrelated practices. To do this we will employ an interlocking cumulative strategy which involves working through three conceptual "cycles": a literacy cycle; a technology cycle; and a learning cycle. Each cycle follows the same kind of format, comprising three subsections.

The literacy cycle, then, contains a subsection devoted to language and literacy—in which we advance some points that can reasonably be seen to be points about literacy per se. This is followed by a second subsection on literacy and technology, and a third on literacy and learning. We then do the same thing with the technology cycle, developing a subsection on technology *per se*, another on technology and literacy, and a third on technology and learning. Finally, we tackle the learning cycle, with a subsection on learning, a second on learning and literacy, and a third on learning and technology. This procedure allows us to develop points in depth without having to say everything at once—keeping all the balls in the air—but with the benefit of keeping always before the reader the awareness that things are much more complex. In the end, the cumulative nature of our presentation will add up to something which is complex in a simple way, and where a more or less linear progression will nonetheless generate a sense of three dimensional dynamism.

In principle, having completed one cycle of cycles—which, inevitably, will be partial—the process could be moved into subsequent cycles, elaborating and refining what has been presented, and picking up issues that have emerged along the way. That, however, is not possible here. We advance and terminate our account with a view to its being "enough for the immediate job at hand", but with the hope that it will be convincing enough to justify others subsequently building further upon it in their future work—work in practice as well as in theory and, ideally, both together as an educational praxis of literacy, technology and learning.

## *Literacy*

### *Language and literacy*

Although educationists, policy makers, teachers, and the lay public often talk unproblematically about language and/or literacy, they are highly ambiguous and confusing concepts so far as formal educational settings are concerned. Before turning in greater depth to some of the key issues at stake in this study, it is worth noting something of the range of more or less discrete notions of language and literacy evident in everyday educational texts—from policy documents and syllabus materials to educational theory.

- language as standard (Australian) English (cf. DEET, 1991a, 1991b);
- language as "languages other than English";
- language as the linguistic components of Subject English (Curriculum Corporation,

1994a);
- language as (English) language across the curriculum;
- languages as the logics of discipline areas, or what Hirst (1974) calls “forms and fields of knowledge”;
- languages as the bodies of literature of discipline areas (or “forms and fields of knowledge”);
- literacy as encoding and decoding skills;
- literacy as defined in the Statement on English for Australian schools (Curriculum Corporation, 1994a);
- literacy as "a shorthand for the social practices and conceptions of reading and writing" (Street, 1984, p. 1)—hence, literacy as literacies;
- literacy as mastery of secondary Discourses (Gee, 1996)—hence, literacy as literacies;
- literacy as school subject literacies (Green, 1988).

Traditionally, we have thought of literacy in terms of reading and writing. To be literate has meant to have some degree of competence with printed (written) texts. Of course, there has been wide variation around this conception. For many, literacy has meant possessing mechanical skills of encoding and decoding, together with whatever cognitive capacities go with skill mastery. Encoding and decoding skills were seen as building blocks for doing other things. According to this view, once one is literate one can get on with learning e.g., by studying subjects in a curriculum. Indeed, from this perspective, once people are literate they can use it in all sorts of ways—individually and/or more collectively—as a tool or means for pursuing diverse benefits (employment, knowledge, recreational pleasure, personal development, economic growth, innovation, etc.). This view is what Street (1984) refers to as the “autonomous” model of literacy. Literacy is seen as a unitary phenomenon (e.g., a tool, technology, identifiable set of skills). As such, it can serve as a means to further ends, acting as an independent variable which brings about outcomes in its own power. From the “autonomous” perspective, literacy is seen as a neutral technology: it can be used for all sorts of ends/purposes, whether lofty or trivial, good or bad, personal or collective.

During the 1970s and 80s, a *sociocultural* approach to understanding and researching literacy became increasingly visible. From this standpoint, literacy is best understood as referring to “the social practices and conceptions of reading and writing” (Street, 1984, p. 1). As such, literacy is really *literacies*, since print-based activities take many different forms—some of which are very unlike others in terms of purposes, the kinds of texts involved, and so on. According to a sociocultural approach these differences must be seen as residing in the literacies themselves, rather than outside or independently of them, since we never learn, teach, or employ literacy “skills” in context-free ways, but always within some context or practice (or other). Hence, literacy is not an independent variable, producing effects outside of itself. Rather, literacy is inseparable from the practices and their effects. Literacy is always acted upon as well as acting upon elements within contexts of practice. Literacies always come in association with practical purposes and are always embedded within larger practices: e.g., running a home, completing an assignment, organising an event, giving orders, exchanging information, being at leisure. To this extent, literacies

cannot be neutral, since as practices they are necessarily bound up with values, purposes, beliefs, aspirations, goals, and the like. For this reason, Street named this latter perspective the "ideological" model of literacy (Street, 1984, p. 1).

Even so, regardless of whether literacy was construed as autonomous or ideological, it has generally been understood in terms of reading and writing. Recently, however, attempts have been made to institutionalise a broader account of literacy that goes beyond simply reading and writing, in the received senses, to include talking and listening as well as "critical thinking" (DEET, 1991a, 1991b). This move came in the light of "literacy" emerging as a key organising category in educational and social policy contexts during the 1980s. Many literacy professionals responded by redefining literacy as, in essence, "language and learning". This, however, robbed literacy of any sense of specificity as a category, thereby reducing and restricting its use-value.

Michael Halliday was quick to point out that if literacy is disassociated from reading and writing, and generalised "to cover all forms of discourse, spoken as well as written", it would be necessary to find another term for what was previously called literacy -

> because it is still necessary to distinguish reading and writing from listening and speaking practices. Neither is superior to the other, but they are different; and, more importantly, the interaction between them is one of the friction points at which new meanings are created (Halliday, 1991, p. 3).

Halliday sees literacy as referring specifically

> to writing as distinct from speech: to reading and writing practices, and to the forms of language, and ways of meaning, that are typically associated with them (ibid).

We see this as being still very much a *linguistic* viewpoint and, moreover, one which is locked into a verbal-logocentric view of the world (cf. Stewart-Dore, 1996) that is simply not comprehensive enough to cater for the changed forms and circumstances of multi-literate practice.

A crucial new player in the professional, academic and public debate over literacy and education has now emerged, in the form of the burgeoning new communications and information technologies. As we will argue below, this renders problematic the linguistic view of literacy and requires us to reconceive literacy as involving the articulation of language and technology. This point will be taken up in the following section on literacy and technology.

There is, however, more to be said immediately about literacy per se. From a sociocultural perspective, literacy must be seen in "3D", as having three interlocking dimensions—the operational, the cultural, and the critical—which bring together language, meaning and context (Green, 1988, pp. 160-163; Green, 1997a, 1997b). An integrated view of literacy in practice and in pedagogy addresses all three dimensions simultaneously; none has any necessary priority over the others.

The *operational* dimension refers to the means of literacy in the sense that it is in and through the medium of language that the literacy event happens. It involves competency with regard to the language system. To refer to the operational dimension of literacy is to point to the manner in which individuals use language in literacy tasks, in order to operate effectively in specific contexts. The emphasis is on the written language system and how adequately it is handled. From this perspective, it is a question of individuals being able to read and write in a range of contexts, in an appropriate and adequate manner. This is to focus on the language aspect of literacy.

The *cultural* dimension involves what may be called the meaning aspect of literacy. It involves, by contrast with the operational dimension, competency with regard to the meaning system (Lemke, 1984). This is to recognise that literacy acts and events are not only *context* specific but also entail a specific *content*. It is never simply a case of being literate in and of itself but of being literate with regard to something, some aspect of knowledge or experience. The cultural aspect of literacy is very much a matter of understanding texts in relation to contexts—to appreciate their meaning; the meaning they need to make in order to be appropriate; and what it is about given contexts of practice that makes for appropriateness or inappropriateness of particular ways of reading and writing. Take, for example, the case of a worker producing a spreadsheet within a workplace setting or routine. This is not a simple matter of "going into some software program" and "filling in the data". Spreadsheets must be *compiled*—which means knowing their purpose and constructing their axes and categories accordingly. To know the purpose of a particular spreadsheet requires understanding relevant elements of the culture of the immediate work context; to know why one is doing what one is doing now, how to do it, and why what one is doing is appropriate.

The *critical* dimension of literacy has to do with the socially constructed nature of all human practices and meaning systems. In order to be able to participate effectively and productively in any social practice, humans must be socialised into it. But social practices and their meaning systems are always selective and sectional; they represent particular interpretations and classifications. Unless individuals are also given access to the grounds for selection and the principles of interpretation they are merely socialised into the meaning system and unable to take an active part in its transformation. The critical dimension of literacy is the basis for ensuring that participants can not merely participate in a practice and make meanings within it, but that they can in various ways transform and *actively* produce it.

The debate currently emerging in Australia around benchmarks and literacy standards provides a rich context and a powerful incentive for clarifying the relationship between notions of "reading" and "writing", "text", "meaning" and "practice". The nature and importance of a sociocultural approach to literacy within the context of this debate become key considerations.

Gee (Gee, Hull & Lankshear, 1996, p. 2) argues that, properly understood, reading is always and necessarily reading *something* with *understanding*. This involves much

more than merely encoding and decoding texts with technical or mechanical accuracy and proficiency. To invoke one of Gee's arguments, if any well educated people (such as readers of this report) need to be convinced about this point, "and assuming they have had no background in philosophy [a social practice], they need only read [decode] a few pages of Hegel's *Phenomenology of Mind*. They will immediately become convinced that they cannot read Hegel in any useful sense of the word 'read'" (Gee, Hull & Lankshear, 1996, p. 2). To be able to *read* Hegel presupposes considerable experience and learning within the social practice, or Discourse (Gee, 1996) of philosophy.

There is more, however. Texts can be read in different ways. We are not making the simplistic point here that texts are often ambiguous. Rather, we are arguing that the meanings made of a given text may differ greatly according to the communities of social practice readers have inhabited. A further example provided by Gee illustrates this succinctly.

> Consider the following sentences from a brief story in which a man named Gregory has wronged his former girlfriend Abigail: "Heartsick and dejected, Abigail turned to Slug with her tale of woe. Slug, feeling compassion for Abigail, sought out Gregory and beat him brutally".
>
> In one study some readers, who happened to be African-Americans, claimed that these sentences "say" that Abigail told Slug to beat up Gregory. On the other hand, other readers, who happened not to be African-Americans, claimed that these sentences "say" no such thing. These readers subsequently claimed, in fact, that the African-Americans had *misread* the sentences. The African-Americans responded: "If you turn to someone with a tale of woe and, in particular, someone named "Slug", you are most certainly asking him to *do* something in the way of violence and you are most certainly responsible when he's done it" (Gee, Hull &Lankshear, 1996, p. 2).

This requires us to look closely at claims to the effect that there are "right" and "wrong" ways of reading a text and that some readings are "wrong" or "go too far". Our account requires us to see such claims in relation to contexts of reading and practice, and to ask in given cases *who* (i.e., *whose* Discourse or version of practice) gets to determine the matter. This, of course, has major implications for school, since "school literacy" can be seen as a context of determining such things and systematically privileging some ways/readings over others.

The key question arising here is: "*How* does one acquire the ability to read a certain type of text in a certain way?": that is, how does one acquire the ability to make [a particular] meaning or meanings from a given text? According to the sociocultural approach to literacy adopted here,

> a way of reading a certain type of text is acquired *only* when it is acquired in a "fluent" or "native like" way, by one's being embedded in (apprenticed as a member of) a *social practice* wherein people not only *read* texts of this type in this way but also *talk* about such texts in certain ways, *hold certain attitudes and values* about them, and *socially interact* over them in certain ways (Garton

> & Pratt, 1989; Heath, 1983; John-Steiner, Panofsky & Smith, 1994; Scollon & Scollon, 1981; Lave & Wenger, 1991.) (Gee, Hull & Lankshear, 1996, p. 3).

This is to identify texts as integral elements/components of social practices, or Discourses (Gee, 1996). Texts are inherently components of *"lived*, *talked*, *enacted*, *value-and-belief-laden* practices carried out in specific places and at specific times" (Gee, Hull & Lankshear, 1996, p. 3).

There is a clear implication here, which is of the greatest significance to issues of literacy and learning as we increasingly engage new electronic technologies and the myriad larger social practices in which they are employed. It is that the reading or literacy "bits" cannot be abstracted from the larger practices of reading/meaningful practice/practices of making, sharing, transmitting, etc., meaning.

> [W]e can never extract just the bits concerned with reading (or "literacy" in any other sense) and ignore all the bits concerned with talk, action, interaction, attitudes, values, objects, tools, and spaces. *All the bits*—the print bits and the non-print bits—constitute an integral whole. Apart from the social practices in which they are acquired and in which they are always embedded, the "literacy bits" do not exist, or at least they do not mean anything (in several senses of the word "mean"). Once extracted from the practices they are not the "same thing' that existed in the living social practice. (Gee, Hull & Lankshear, 1996, p. 3).

Hence, from the sociocultural perspective adopted here, any concern with reading, writing, *literacy*, inevitably ends up at *social practices* which *integrate* talk, action, interaction, values, beliefs, goals, purposes, aspirations, ideals, ways of behaving, and so on. That is, reading and writing as *meaningful practice* is always inherently bound up with some *way or ways of being in the world*. The tools or technologies of literacy (from print to computers) are always situated and employed within contexts of practice which permit certain productions of meaning and constrain others.

*Literacy and technology*

We are in the midst of a shift from print to digital-electronics—from the print apparatus as the organising context and resource for educational and social practice to the digital-electronic apparatus (Green, 1997a, 1997c). This involves the coming together of publishing, broadcasting, computing and telecommunications in the form of digital global media networks, and raises some very important issues at the nexus of language and technology. These include issues about the relationship between literacy and reading and writing in traditional received senses. Before addressing these issues, however, the current shift from print to digital-electronics alerts us to the fact that literacy is best understood as associated with and arising out of particular relationships between language and technology.

Until now, technology has been at best an ancillary consideration in literacy studies and literacy work. Some more recent accounts (Green, 1993; Green & Bigum, 1996) begin to make the case that literacy and technology are integrally related, and that

literacy is necessarily defined in relation to available technologies—so much so that literacy itself might be understood as, and in terms of, a fundamental relationship between language and technology.

We argue that written language is always-already *technologised*, in the sense that it comes into being only in and through available technologies of information and communication. As a distinctive social practice which is linked in complex ways to other social practices, literacy is best understood, historically, in terms of particular formations of language and technology. It only comes into being through available technologies of information and communication: such as marks on natural surfaces, the alphabet and other symbol systems, stylus and pencil, the printing press, and the digital-electronic apparatus. Whatever the particular technologies involved in specific cases, technology is always necessarily inherent in literacy. Heightened sensitivity to technology is likely, therefore, to enhance the quality and effectiveness of literate practice. Furthermore, as we will see, the development of new technologies has implications for changing forms and practices of literacy, thereby compelling attention to the notion of new and emerging literacies and new associated forms of human subjectivity (Green & Bigum, 1993).

Bigum and Green (1993, p. 5) identify four ways in which literacy and technology might be associated: "technology *for* literacy"; "literacy *for* technology"; "literacy *as* technology"; and "technology *as* literacy". "Technology for literacy" means applying various information technologies to literacy pedagogy. "Literacy for technology" refers to text-mediated practices that enable people to operate particular technologies, such as reading a manual to tune a television set, program a VCR, tune a vehicle engine, and so on. To speak of "literacy as technology" is to recognise that the various socially constructed and maintained practices and conceptions of reading and writing that exist (Street, 1984) comprise so many social technologies: ways of applying means to ends, tools/techniques to purposes, or applying modes of knowing to goals. The notion of "technology as literacy" is involved in talk of people being computer literate, information literate, audiovisually literate, and so on. In such uses, "literacy" stands in for a body of knowledge, or know-how (Bigum & Green, 1993, p. 6), such that to be literate is to possess an acceptable amount of the knowledge and competency in question.

Understanding literacy as arising out of particular, historically specific relationships between language and technology is salutary in several ways. First, it directs our attention to the historical significance of particular formations of language and technology, such as those associated with the print apparatus and the new digital-electronic apparatus, respectively: the social relations and practices organised around the printing press, on the one hand, and those organised around the computer, in its various forms, on the other. It would be revealing to examine in such a light technologies such as the slate, the ballpoint pen, the typewriter, the photocopier and the tape-recorder.

Second, adopting this perspective enables more rigorous and precise engagement with the concept of practice itself, bringing together *meaning* and *practice* as key organising principles. Traditionally, the tendency has been to think of language primarily in terms of meaning, and to work accordingly with notions of "meaning-

making" and "communities of meaning". This risks encouraging idealist, psychologistic views of literacy and learning. While recent linguistic and discourse-analytic work has increasingly stressed language usage as social practice (Fairclough, 1989), it has proved quite difficult to institutionalise such views, partly because they seem to fly in the face of popular understandings of language and meaning.

Working from the outset with an emphasis on technology has the value of foregrounding the principle of practice, via the close association between technology and practice outlined above. This in turn enables a stronger conceptual grasp of the thesis that literacy is best understood in terms of meaning *and* practice, and the relationship between them. Classrooms working with technologised forms of literacy are therefore best understood as both communities of meaning, constructed collaboratively over time, and as what have been described as communities of practice (Lave & Wenger, 1991). In this way, emphasis in research and teaching alike falls on the practice of meaning and the meaning of practice. This is taken up in greater detail below under Technology and literacy.

*Literacy and learning: learning literacy/learning through literacy*

There is wide agreement about the importance of language and literacy in and for learning. Language practices—reading, writing, speaking, listening, viewing—are intimately and organically connected to learning processes. While the nature of the relationships is open to debate, the links themselves are not. A central and influential formulation exists which originates in the work of Halliday. This portrays language and literacy learning in terms of three interrelated aspects:

- learning language;
- learning through language;
- learning about language.

In other words, language learning involves learning how to use language, learning through the use of language, and learning about language, both directly and indirectly. This latter aspect—learning about language, or the role and significance of explicit knowledge of language as system and as practice—has been much debated in recent times, both professionally and in the public forum of the popular media.

Importantly, it is not simply *language* learning that is at issue here. Rather, it is learning more broadly, across the school curriculum and at every level of schooling and beyond. Language practices—notably,*literacy* practices—are centrally involved in the social practice of learning. This underpins the significance of notions such as "subject-specific literacies" (Green, 1988), and academic and disciplinary literacy more generally. Thus we do well to add the following schema to the previous one:

- learning literacy;
- learning through literacy;
- learning about literacy.

The relationship between "learning literacy" and "learning through literacy" is very

important. Learning literacy refers to the development of literacy competency—how children become literate. The second concerns literacy as a tool for learning. From the first standpoint, literacy is seen as the goal for schooling. From the second, literacy is the means of schooling. We see the relationship between the two as dynamic and reciprocal: mutually interdependent and mutually informing. That is, literacy develops (is learned) in use, in the course of learning. At the same time, learning in schools proceeds very much on the basis of literacy.

To look at literacy as the goal of schooling is to see the realisation of literate individuals and a literate society as an important intended outcome of schooling. As James Donald (1983) points out, the need for "universal literacy" was and remains a major motive for developing compulsory mass schooling. From this perspective, it is clear that schooling across the entire curriculum has a contribution to make to developing literacy understood in these terms.

To focus on literacy as a means to achieving the goals of schooling involves considering the role and significance of literacy as an instrument of learning. The question is how best to enhance students' opportunities for learning and also the quality of their learning within the context of school study—where the school constitutes a specific social context. This requires specific attention to spoken and written language (Christie 1985; Green, 1988, p. 167).

The view we take is that literacy is best considered as a particular kind of situation-specific competency with regard to written language usage. Because there are many different situation-specificities/specific situations, there are many *literacies*. Consequently, looking at literacy in relation to learning calls for emphasising the importance of context. Meaning making and language usage are both enabled and constrained by the contexts in which they occur. An adequate understanding of language involves explicit consideration of contexts in which it occurs, and appreciation of the extent to which different context shape and determine the kinds of meaning people make and can make.

Two aspects of the context of school as a site for literacy learning and learning through literacy are important. First, as a context for literacy the school is significantly different from other social settings—in terms of the purposes for reading and writing and the range of what is read and written. This is closely linked to the compulsory character of schooling and its function as an allocator of credentials. Second, school is a context of different disciplinary subject areas. Hence, how and what one reads and writes in one learning/subject area can vary greatly from how and what one reads and writes in another. Green (1988) focuses on school learning as structured in terms of an array of more or less distinct subject areas or disciplines. He draws on Applebee's account of writing in secondary school, which recognises that "major subject areas represent differing universes of discourse, each with characteristic registers and differentiated writing skills" (Applebee 1981, p. 4). This point is crucial to understanding and conceptualising subject-specific literacies, where becoming discipline literate is integral to the purpose of schooling: i.e., the educated, competent school graduate is competent in terms of having mastered the subject literacies (or, at least, a range of them) of the school curriculum. The disciplinary subject area as a context for literacy can be conceived in two ways. Both are necessary. The first is to

focus on the situational context of the particular subject area. This means mastering the language appropriate to that particular context and, hence, requires accounting for *register*. It calls for mastering the distinctive kind of language usage associated with that context of situation. The second is to focus on the cultural context of the subject area. This means considering the kinds of behaviour appropriate to that context and, in particular, the kinds of speaking and writing behaviour. This, of course, requires accounting for *genre*.

## *Technology*

*a. Conceptions of "technology"*

Turning to "technology", it is necessary to make some initial distinctions between, for example, technology as objects and artefacts, as particular skills and knowledges, and as process and practice. It is necessary, also, to acknowledge accounts of the *non neutrality* of technology and its social meanings and cultural consequences (Bowers, 1988; Idhe, 1990). This helps us counter everyday tendencies to view technology in simple instrumental terms.

Owen and Abbot-Chapman (1990) note a range of conceptions of technology that recur in educational literature. We will note some of these here before developing some of them in greater depth.

- Technology as tools, machines, gadgets

Many people define technology narrowly, "seeing it [as] referring to the tools we use, especially electronic or mechanical tools" (Owen & Abbot-Chapman, 1990, p. 11). In this sense, technology refers to the outcomes of technological invention, and is implicit in much thinking about technology in relation to learning generally, and literacy learning specifically. To many teachers and administrators, technology "conjures up pictures of expensive and complicated gadgets, especially computers" (Owen & Abbot-Chapman, 1990, p. 11).

- Technology as process

This is the idea of technology as a process, like applying scientific principles, knowledge of economic factors and constraints, and available resources to problems arising in the course of human living. From this perspective, it is technology as a process that gives rise to technologies in the previous sense, as outcomes or by-products of the quest to find more efficient means of satisfying wants and needs. This notion is found in ideas that the new workforces require workers who understand the production process as a whole, can innovate, make flexible shifts, find improved ways of doing things, and add maximum value to production resources.

- Technology as a human capacity

From this perspective technology is construed as some capacity or disposition to

engage in the process of technology; a tendency toward behaving technologically.

- Technology as education

In recent years older notions like “manual arts” and “technical education” have been increasingly displaced by talk of technology education. There are both narrower and wider conceptions of technology education. In the narrower sense, technology education is seen in terms of learning how to use tools—especially new, “sophisticated” tools. In this view technology education is seen as especially concerned with teaching students about computers and computing. In a wider sense, technology education is defined in terms of mastering a process. In some versions this includes a component which situates technology—whether as outcomes, process, effects, etc.—centrally within social, cultural and environmental contexts. This involves learning how, when, and why humans engage the process (practice?) of technology, and with what consequences or effects. As such, issues of ethics, politics, economics, and the like are integral, if not central, to technology education.

- Technology as Subject Technology

This is a narrower notion than technology education. A technology education would require that the technological dimension of any given subject area should form part of the learning focus within that subject. Subject Technology is an important part of a learner’s technology education, but by no means all of it. It would have a self-contained syllabus, but would interface with other curriculum subjects and help to inform them—in their own right, and as a contribution to the larger notion of technology education.

Technology has emerged as one of eight key learning areas for Australian schools, and a statement on technology for schools was published in 1994 (Curriculum Corporation, 1994c). As an identifiable learning area, Technology is a response to current changes seen as calling for Australians to become “more innovative, knowledgeable, skilful, adaptable and enterprising” (Curriculum Corporation, 1994c, p. 4). Pragmatically, learning about technology is intended to help maximise learners’ future employment and social prospects through the development of appropriate skills, understandings and capacities. Specifically, these include skills of analysis, problem-solving, information processing and computing; understanding of the role of science and technology within society; awareness of and commitment to balanced global environmental development; and capacity to make judgments on moral, ethical, and social justice issues.

Learning activities are intended to engage learners in producing and acting on ideas, as well as using and developing processes and products related to meeting human needs. These activities are undertaken within a larger context of developing knowledge and understanding of past and present technology, and investigating emerging trends and technological possibilities. The statement on Technology makes it clear that learning should address each of the operational, cultural, and critical dimensions defined above in relation to literacy, but which—from a sociocultural perspective—are applicable and appropriate to all social practice. The statement implies a strong commitment to the development of a meta-level appreciation of

technology as a human modus operandi.

In "structural" terms, Technology is framed as an area of study comprising four strands. The first of these, "designing, making and appraising", is integral is a constitutive component of learning across all strands. The remaining strands—Information, Materials and Systems—receive relative emphasis in accordance with student needs and local programming. Whether Technology is structured and provided as discrete programs or somehow combined with other learning areas is seen in the statement as being open to choice. At secondary school level, Technology programs envelope a range study areas, including agriculture, computing/information technology, home economics, media, industrial arts, manual arts, design and technology.

The Technology key learning area is a focus in several of the site studies undertaken in this project.

Having surveyed some of the common conceptions of technology that coalesce around educational thought and practice, we will develop two ideas here in greater detail. These are the notion of what Arnold Pacey (1983) calls technology-practice and the idea of Information Technology as simultaneously Resource and Context.

i. Technology-Practice

> Scientifically based technological systems have become, with a few exceptions . . . almost as sacred as the national security establishment they have served. All sorts of magical wonders are ascribed to them. (Aronowitz & deFazio, 1995, p. 60)

Technology is not the name for some specific "thing" or "phenomenon"; it is not an autonomous independent causal factor; it is not value neutral; and it should not be thought of in simple "instrumental" terms—i.e., means to ends or as a "tool". It is important to think of technology as *practice*—as ways of doing things (Franklin, 1990)—albeit in a particular and sophisticated sense of "practice".

Arnold Pacey (1983) has developed a very helpful concept of technology-practice on the model of *medical practice*, and distinguishes this from narrower conceptions of technology. He observes that medical practice takes very different empirical forms across different social and cultural contexts (countries, regions, zones, etc.). Yet many of these different forms draw on substantially the same medical science (conceived in terms of knowledge and techniques). That is to say, the same body of medical science can underlie very different forms of medical practice. Medical practice, in this sense, refers to the overall activity of providing medical goods, services, resources, research and development within a particular setting. This includes "its basis in *technical knowledge*, its *organization* [e.g., public system versus private system; centralised versus localised system; systemic versus ad hoc provision; free provision versus a "user pays" approach, etc., and all the possibilities in between these extremes], and its *cultural aspects* [such as a doctor's sense of vocation, personal values and satisfactions, and the code of ethics binding the profession]"

(Pacey, 1983, p. 3).

On the basis of this model, Pacey conceptualises technology-practice as including organisational, technical, and cultural aspects, and distinguishes it from restricted constructions of technology. Pacey says that the restricted sense of "technology" consists in the technical aspect alone. More general views, on the other hand, might include the idea that technology refers to some general and abstract process of designing, making, and appraising products or artifacts intended to serve human purposes. In terms of the following diagram provided by Pacey, "technology-practice" refers to everything that goes on within a triangle whose three points are defined by the organisational, cultural, and technical dimensions of human technological activity. According to Pacey, technology-practice is "the application of scientific and other knowledge to practical tasks by ordered systems that involve people and organizations, living things and machines" (1983, p. 6).

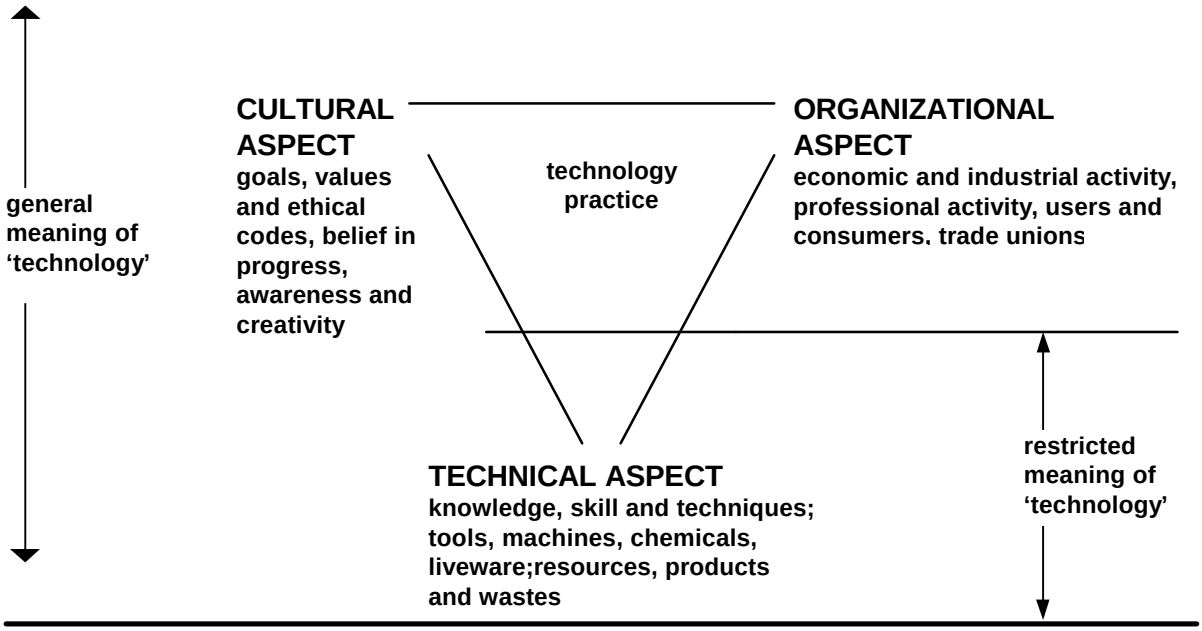


***Figure 1: Diagrammatic definitions of 'technology' and 'technological practice' (Pacey, 1983, p. 6)***

If we take Pacey's account of technology-practice, we can see that "being technological" takes countless forms—many of which are still to emerge, whilst many others have passed. People become very different kinds of technology-practitioners under different cultural and material conditions. From the perspective of technology-practice they are no more or less *technological* than people who operate under different constellations of cultural and organisational values around the three variables of technique and technical infrastructure and theory, different organisational norms, and different cultural ways of being. One important point to note here is that not all of these forms of technology-practice are equal at the level of institutionalised allocation of social goods (power, prestige, wealth/income, status). To invoke Gee's notion of dominant and subordinate Discourses (Gee, 1991, 1996), we can say that some discursive constructions of technology-practice have become dominant, while others are subordinate. Within any sociocultural milieu, dominant forms of technology-practice are hegemonic. Within their sphere of ideological sway, the admonition to be

technological is not so much the admonition to be technological as opposed to not being technological. Rather, it is the admonition to be technological *in a certain kind of way*: like *this*. The admonition is, of course, backed up by the institutionalised allocation of social goods within that milieu.
This is not a matter of "all out power", however. We are not talking about some monolithic global scene here: at least, not yet. We find all sorts of local contexts in which "traditional" ways of being technological retain dominance in the face of more "modern" competing forms. At the same time, any teacher within Australian classrooms will recognise immediately what these ideas mean in concrete terms when it comes to current admonitions to be technological.

Finally, this view of technology-practice is by no means the only view available. It depends on carving up the sociocultural/discursive "universe" in a somewhat territorial way: such that technology-practice masquerades as some kind of identifiable "space" of human activity, alongside others, such as medical-practice, education-practice, religious-practice, political-practice, and so on.

As such, technology-practice in the manner described faces competing views. For example, it differs in important ways from, say, Ursula Franklin's (1990) notion of technology as *practice*: in the sense of "technology" as the means whereby things get done socially and culturally. This is a broader notion than Pacey's, since it allows us to think of spheres and sites of practice that would, on Pacey's account, fall outside technology-practice as nonetheless being "technologies". This is helpful in enabling a view of literacy as itself a form of technology, in the sense that historically, as with schooling, it has been a means whereby individuals and populations are formed as productive, useful social identities.

Franklin's emphasis upon technology as *practice* supports interrogations of the processes by which particular technologies are adopted. In the social acceptance of particular technologies, she argues that certain practices are reinforced and favoured over others in supporting the adoption of a particular technology, often via the development of material infrastructure which supports one technology over another. Latour (1991) makes a similar point when he argues that society is technology made durable, that is, the means by which things get done is fixed in a material form, like word processing software, mobile telephone or classroom. Franklin draws attention to the work that needs to be done in order to establish a technology beyond a hobbyist fad.

Establishing a particular way of doing things in Franklin's eyes is highly political and typically involves a large amount of "unpaid product development engineering". The work that teachers have carried out in classrooms since the early 1980s is an instance of such work and arguably has contributed to establishing the educational credentials of computer technology for the wider community and hence its take up as an educational device in the home. Franklin highlights the work that needs to be done at all stages during which a particular technology comes to be an accepted way of doing things. In most cases, this is accomplished by building a dependence on getting things done in a particular way. We live in a world in which our day-to-day activity reflects a large number of such dependencies.

ii. Technology as "the new communications and information technologies" (CITs): the Resource-Context Model

As noted above, in the minds of many educators "technology/ies" has come to mean the new communications and information technologies, or the machinery of the digital-electronic apparatus. In the narrowest sense, this denotes computers and computing. In its widest sense, it means "the coming together of publishing, broadcasting, computing and telecommunications in the form of digital global media networks", together with "the connection of these networks with new and emergent forms of subjectivity and new institutional practices" (Green, 1997a, p. 2; also Green & Bigum, 1993).

The shift from print apparatus (printing press, book, "conventional" texts) as the organising context and resource for educational and social practice to the digital-electronic apparatus has massive implications for schools and for school-based learning: specifically here, learning about and through literacy. Take, for example, Douglas Rushkoff's (1997) notion of the "screenager" as an embodiment of new and emergent forms of subjectivity and new institutional practices—a phenomenon addressed by Bigum and Green (1993) when they inquire whether there are "aliens" in our classrooms? What is the reference point for understanding this new social subject, this new form of life? One thing we can say is that it is most certainly *not* the school in its conventional terms and forms. Yet, school remains, nominally at least, their assigned (compulsory) milieu; their officially designated habitat for a large proportion of their daily lives.

This generates a pressing problem; a need to take up the challenge of re-imagining and re-inventing ourselves and our institutions—which implies, not least, coming to terms with re-imagined and re-invented forms and practices of literacy, subject matter, and learning. For literacy educators it is imperative that we re-assess our vocation and our work, taking into account both its object/goal (literacy) and its environments. This, however, must not be done "blind". As much as with literacy and with technology in general, it is important to adopt a socially-critical perspective toward CITs—particularly as concerns their educational applications and implications. This is a perspective which locates new technologies within history and culture, emphasising their status first and foremost in terms of social practice. It involves both a certain kind of attitude or orientation toward new technologies and particular understandings and skills.

> This in turn needs to be linked to a notion of "cultural apprenticeship". It is all very well to sit on the sidelines and criticise the encroachments of 'techno-culture", to develop highly elaborated, more or less "damning" critiques from the outside, or further, simply to dismiss all such matters out of hand, either through ignorance or through . . . "technophobia" or "techno-fear" . . . [A]ll educators need to become appropriately informed and skilled with regard to the new technologies, which in this case means becoming critical consumers or users (and "insiders", albeit of a rather complex kind). (Bigum & Green, 1995, p. 13)

A useful place to start here is with the notion of CITs as being simultaneously a Resource and Context for educational practice. This distinction-relationship, which is dynamically reciprocal (or, dialectical), can be approached via Sproull and Kiesler's two-level perspective on technologies, based on their idea of "first and second level effects" (Sproull & Kiesler, 1991, pp. 1-17).

According to Sproull and Kiesler, "first level" effects refer to planned or anticipated benefits from implementing new technologies—e.g., in terms of productivity or efficiency gains. First level effects can be gauged using such conventions as cost-displacement analysis or value-added analysis. When we think of new technologies as *resource* within educational settings, it is in this sense of using them for the purposes of producing beneficial effects. In the case of literacy education, often claimed first level effects include such things as increased student motivation, greatly enhanced learning outcomes with disabled learners, more pride in one's work, and so on.

"Second level" effects relate to *context*. They are changes in the environments of practice, and in practices themselves, which are contingent upon actually using the technologies. Sproull and Kiesler claim that second level effects mainly come about because

> new communication technology leads people to pay attention to different things, have contact with different people, and depend on one another differently. Change in attention means change in how people spend their time and in what they think is important. Change in social contact patterns means change in who people know and how they feel about them. Change in interdependence means change in what people do and for each other and how these coupled functions are organized into norms, roles, procedures, jobs and departments. Social roles, which codify patterns of attention and social interaction, change. (Sproull & Kiesler, 1991, pp. 4-5)

According to Bigum and Green (1995, p. 14), these second level effects are largely unanticipated—indeed, to a large extent, they are unpredictable—and they are the most important effects of new technologies. This is interesting because in most settings, including educational settings, new technologies are "sold" to us (or, we get "sold" on them) initially on the basis of their alleged first level effects: the benefits, we are told, that (will) accrue from their use as resource. The logic of second level effects is basically simple. When new technologies are introduced into sites of practice they change the social circumstances within which they are used, with the result of changing the way people talk and think about them. One important consequence of this is that social practitioners use new technologies in ways that are often new, unanticipated, unpredictable.

This is a "both ways" logic. Use of new technologies produces changes within settings, which act back on subsequent uses, which in turn act back on settings (including expectations, aspirations, beliefs, purposes) and so on. Hence, the separation between resource and context is not hard and fast. Rather, the relationship is complex. Bigum and Green say here that the relationship between

resource and context

> can be represented as a kind of feedback loop, in which the creation of conditions for computer use (context) allows the use of the computer as a resource. Using the resource creates new ways of thinking about computers, new ways of working, changes in attention, interdependence and changes in social contact patterns (Sproull & Kiesler, 1991), all of which contribute to a changed and changing context, which, in turn, support new practices, further changing the context, and so on (Bigum and Green, 1995, pp 14-15).

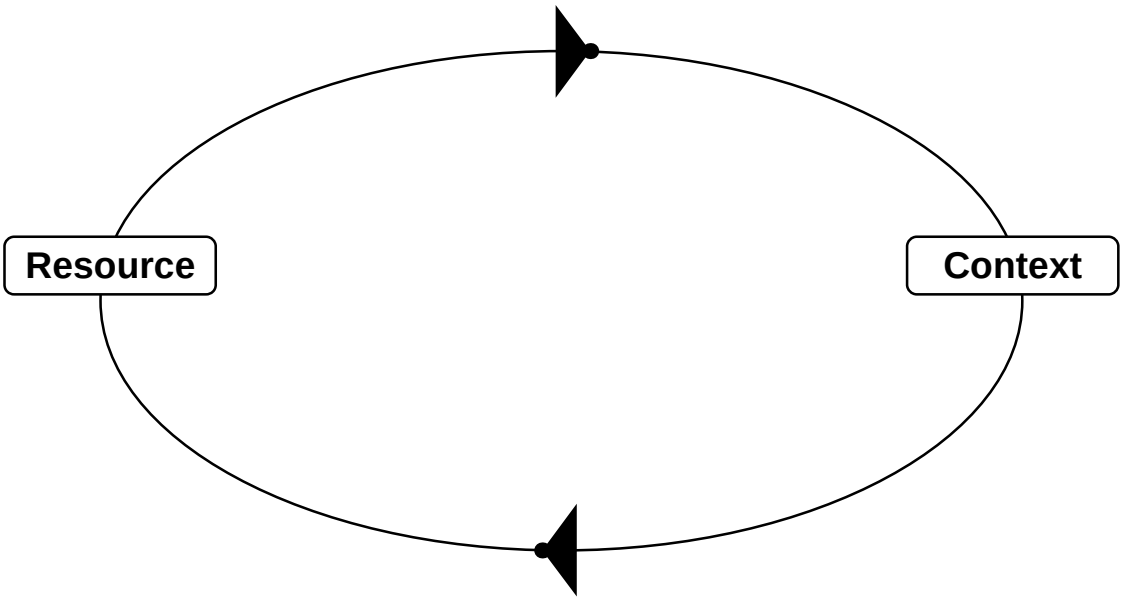


***Figure 2: The context/resource model***

One very important implication here is that predictive claims advanced in support of implementing a given technology are, of necessity, very hard to substantiate before the fact. "This means that what becomes crucial in determining what happens in [educational settings] is not so much driven by what is known, as by rhetorics which draw upon a context that has arisen from past practices of and attitudes towards other technologies" (Bigum & Green, 1995, p. 15).

These sorts of ideas, and the resource-context model which underlies and enables them, are integral to adopting a cultural-critical view of CITs, in assessing their role and significance within literacy-oriented and mediated learning contexts and practices. Bringing *context* and *resource* together in this reciprocal and dynamic way enables us to achieve richer, more comprehensive, more adequately informed views of what integrating new technologies into literacy work actually *means* in terms of social practice. In gauging this *meaning* we must take account of risk factors and other "negatives" as well as of promises and possibilities.

As Bigum and Green (1995, p. 17) observe, the advantages associated with CITs must always be taken into account, and assessed, in tandem with their disadvantages.

> The gains they offer need to be weighted against the losses they might equally represent. As the philosopher of technology Don Idhe (1990) argues, technologies always involve both an amplification of human capacities and a concomitant reduction; the two are inescapably and dialectically related. The dilemma for [literacy educators] is that all the outcomes are extremely difficult to know in advance. In a sense, each new technology has to be socially reinvented at each new site of use . . . [P]roper evaluation . . . requires weighing up all . . . aspects within an informed socially critical and educationally responsible framework for understanding. But because the context-resource relationship is dynamic, some advantages and disadvantages will only be evident after computerisation. In a real sense, then, there must be a measure of faith in any implementation, regardless of the reassurance of experts.

In these terms, the history of the new information and communication technologies in Australia's schools has been characterised by large quantities of faith with returns that are at best difficult to identify. Confounding identification in a school setting is the presence of another powerful technology, that of the school. Put simply, we could say that computers have been "schooled", that is made into things that support and sustain the technology that is the school. As Hodas argues:

> The norms and procedures of entrenched bureaucratic organizations are strong and self-reinforcing. They attract people of like minds and repel or expel those who don't share them. Schools are technologies, machines with a purpose. They embed the norms and processes in their outputs, which in the case of schools helps them to further strengthen their cultural position and resist marginalization. (Hodas, 1996, p. 217)

More is involved than merely addressing the use of the new information and communication technologies in schools in terms of somehow balancing positives and negatives. This may actually misrepresent to some extent the difficult and complex work in which schools and teachers have become enmeshed: namely, in a broad set of processes which contribute to a broad social adoption of computing and related communication technologies. Developing this point further, Iacono and Kling (1996) argue that promoting computerization in general, including within schools, is better understood as a kind of social movement like various environmental movements. They describe the organizations and forms of recruitment of new members, referring in particular to

> a rhetorical form, which we call technological utopianism . . . [This] is a key framing device for portraying societal renewal through technology and allowing people, many of whom know little about computing, to identify with the goals of the movement. (Iacono & Kling, 1996, p.101)

Countering the hyperbole and promotion of technological utopianism are discourses of anti-utopianism which, like utopian discourses "paint with monochromatic brushes: white or black" (Kling, 1996, p. 51). Authors such as Weizenbaum (1984), Winner

(1985, 1986,1989) and Boal and Lakoff (1995) provide accounts, which while offering in some cases powerful critique leave the user with the dilemma of finding a balance of "goods" and "bads" in her/his circumstance. In this vein, Kling argues that,

> [a]ttractive alternatives to utopian and anti-utopian analyses should be more credible in characterizing conflict in a social order, the distribution of knowledge, the ways of solving problems that arise from new technologies. They should rest upon less deterministic logics of social change. Most important they would identify the social contingencies that make technologies (un)workable and social changes that are benign or harmful for diverse groups. (Kling, 1996, pp. 55-56)

The social realism advocated by Kling is an important influence in the empirical work reported in this project.

*b. Technology and literacy*

During the past 5-10 years information technology has entered academic, professional, and public debate over language and literacy as a crucial new player, forcing serious rethinking of literacy in relation to language and technology. While (as noted in the previous section) literacy has always involved, fundamentally, some articulation or other of language and technology, it has really taken the incursion of information technology (indeed, communication and information technologies) to bring this home to the profession.

This involves taking account of what may be seen as a profound shift from, and a decisive moment of the particularly complex transition between, the Age of Print and the Age of Digital-Electronics. This can be seen as a shift in cultural dominance from the print apparatus to the digital-electronic apparatus (Green, 1997a, 1997c).

The metaphor of the "apparatus" is drawn from Ulmer (1989). Ulmer argues that "the apparatus of culture is changing, which includes change not only in technology but in institutional practices and the ideology of the subject as well" (Ulmer, 1989, p. xii). With regard to the print apparatus, attention must be paid to the significance of the printing press and the publishing industry, the emergence of mass compulsory schooling and the invention of the *classroom* as a specific curriculum technology, and that form of subjectivity associated with rationality and the individual. Similar questions need to be asked about the digital-electronic apparatus: the emergence of computing, in all its forms, the significance vis-a-vis education of information networks and media culture, and the possibility—the likelihood—of new forms of rationality and subjectivity, new ways of thinking and being human. The computer needs to be understood as, in Bolter's (1991) terms, a "defining technology" and, moreover, as *the* defining technology for understanding and living through the Postmodern as a new social imperative and form of life. Older, received explanations and perspectives grounded in the discourses and ideologies of the Modern will not do—and certainly not in their unreconstructed forms.

As literacy professionals, we are used to thinking in terms of *language*—the point we made earlier with specific reference to Halliday. Language occupied a good deal of

our training and, thus, our social constitution as professional educators. Indeed, language remains the focus of our work and our forums of exchange and learning. It seems fair to say that, at an explicit or conscious level at least, technology has not hitherto figured greatly in our working lives and professional agendas. Green (1997a) goes so far as to say that something of the "two cultures" effect is apparent here. Historically it was a matter of the opposition of Literature and Science as organising categories for culture and education (Mathieson, 1975), and what this has meant in this instance is that literacy professional, as quintessential "language" people, have largely defined themselves *against* technology. Yet, if we look at the history of literacy, understood as the social practices of reading and writing, and if we further re-conceive of curriculum and schooling as we know it as thoroughly imbued with the logic and techniques of print culture, "essayistic" literacy and written language, the irony of taking up the stance against technology is, in fact, apparent.

In the present context of change, the question arises of how we understand this change when we are so often oblivious to our own technological constitution as exemplary subjects of Book technology. Myron Tuman (1992, p. 2) poses the question of how we study the impact of a new technology on literacy "when our understanding of literacy is itself shaped by an existing technology, often in ways that are not fully conscious". He posits two distinct overarching literacies; "print literacy", and "online literacy":

> The former, grounded in print technology . . . is intricately connected to the ascendancy of modern industrial culture of the last 200 years; the latter, grounded in computer technology . . . is equally connected to various contemporary attempts to move away from industrial culture, to define a new, postindustrial, postmodern sensibility. (Tuman,1992, p. 20)

To account for changing or new and emerging literacies, and transformative proposals for schooling, it becomes useful to attend to the defining technologies of literacy (and education). These are the printing press, or the print-publishing complex more broadly, and the computer.

As information technology, however, the computer troubles our usual association between literacy, literacy pedagogy, and *text*. In short, it requires us to view literacy as involving, fundamentally, the integration of text and information. There are two related issues here. The first concerns the adequacy of conceiving literacy in terms of text. The second concerns present tendencies working toward disassociation of "text" and "information": a disassociation we will have to come to terms with. We will address these issues in turn.

Much recent work in literacy pedagogy has emphasised text. There is growing recognition of the centrality of texts in curriculum practice. Kress (1995) has recently argued convincingly for a renewed understanding of the relationship between curriculum and text, or textuality. Such work is beginning to map out "a pedagogically useful theory of text . . . a theory which is adequate to all the demands of the curriculum" (Kress, 1995, p. 33). This work is important. Yet, Kress, Lemke and

others engaged in this work also recognise the need to problematise and extend our existing notions of text and literacy. Is what has been called "the text metaphor" (Morgan, 1996) adequate or even appropriate for understanding multimedia practices and flows, or meaning-making practices more generally in a dramatically mutating "semiotic landscape" (Kress, 1995, p. 25). Does it encompass image? Sound? Multimodality? Non-linearity?

The further issue for text-centric views of literacy is that, increasingly, there is a disassociation of "text" and "information", attendant in particular on the operation and application of new and emergent technologies. We are used to thinking of texts as encompassing, or subsuming, information; to seeing information as subordinate. From this perspective, "information" is secondary to "understanding", or to usage. While this view may be dominant among literacy professionals, not all theorists of literacy have thought this way. As long ago as 1982, Donald Murray's account of the composing process intimated the separation of text and information in literacy practice. Murray (1982) distinguished two counter posed forces operating on a text under composition, discussing these in terms of two intersecting axes: a *textual* axis ("generating", "evaluating"), and an *informational* axis ("collecting", "connecting").

This makes even more sense when database technology is taken into account (cf., Bigum, 1987). Here the notion that something has changed decisively in the postmodern world, as a direct consequence of the proliferation andcomplexification of new technologies, is particularly interesting. Poster (1990, p. 18) has explored different aspects of what he calls the "mode of information", a distinctive new order of social existence mediated and managed significantly by new technological resources and new technocultural regimes. He is particularly concerned with "the basic question of the *configuration* of information exchange", "the wrapping of language" (Poster, 1990, p. 8). Poster's concern can be traced through his account of database technology.

Poster argues that database constitutes a new and distinctive communication form. "The mode of information initiates a rethinking of all previous forms of language" (Poster, 1990, p. 85). Electronic language is differently organised and realised than either speech or writing, in such a way as to enable us to recontextualise all our previous understandings and experience of language and communication. While Poster advances several ideas here, we will focus on the way electronic language destabilises our conventional view of text (see also Heim, 1989); of what constitutes and counts as text.

The notion of *bounded-ness*, or *limits* is central here. In the print era we could always (and only) point to bounded instances of information and communication. That was their sole mode of being—a *text* of some kind. Texts have edges, borders, margins: the very condition of print (Tuman, 1992). With database (and, even more radically, with hypertext or hypermedia), however, where is the text? Indeed, when and what is the text? (Which is *text* and which is *context*?) Is it the database as a whole (if so, what about an open-ended, relational, networked database)? Is it an individual report? The program? The sum of all reports? A selection of them? The uses made of these reports? The problem is that "inside" the database, there are no distinctions; everything is digitalised and virtual(ised). In this sense we can talk meaningfully and

usefully of the separation of text and information.

This very notion, however, is highly problematic for any literacy educator concerned with a 3D sociocultural literacy. Information, the currency of postmodern life, poses massive challenges for proponents of culturally-critical educational ideals. As Poster notes (1990, p. 7), "information has become a privileged term in our culture"; "the current culture gives a certain fetishistic importance to information" (p. 6).

This new privileged status of information confronts head on the liberal-humanist tradition of literacy theory and pedagogy. As an exemplar of this influential tradition, Frank Smith, for example, opposed his preferred view of literacy as "creating worlds" to what he saw as the dominant view of "shunting information". "The creation of worlds", said Smith, "is a more productive and appropriate metaphor for language, literacy and learning than the shunting of information" (Smith, 1985, p. 197).

As much as literacy educators might sympathise with Smith's preference, we live and work now in a time that is, above all else, technologically-textured and media-saturated, *informationalised*. Our postmodern lifeworld is the time of IT: a time characterised by digital convergence and global networks, with marked transformative effects in terms of the now thoroughly intricated cultures and industries of publishing, broadcasting and computing, entertainment and information, banking and finance. In Negroponte's words, "computing is not about computers any more. It is about life" (Negroponte 1995: 4): "digital life".

It is necessary in education to address the ideology and rhetoric of information. "Information" is a key concept in the age of the Computer. It cannot be ignored or glossed over. We need a theoretical and educational account that takes seriously the social-cultural nature of teaching and learning, yet is sensitive to the likelihood that these practices are necessarily transformed in the cult(ure) of information. To date we have scarcely begun to imagine what taking this on board might mean for literacy and education. We will take this up in a preliminary way in the following section, on Technology and Learning.

Before turning to this, however, it is timely to review where we have got to so far in developing a conceptual and theoretical framework. It is crucial that a framework for thinking about technologies and literacy emerge from this study. What has already been said in this chapter takes us a good part of the distance here. Thus far we have outlined a model which both distinguishes between *and* draws together language and technology, on one hand, and text and information on the other. We drew earlier on the notion that literacy involves particular articulations of language and technology, broadly associated with historical-cultural junctures (cf. section on Literacy and technology above). The relationship of text to information, essayed immediately above, is a further step. Literate practice, then, is a matter of negotiating these different yet related aspects—as captured in Figure 3.

It is also useful and important to provide a classification schema for thinking about the various types of literacy/computing. A similar schema to the kind envisaged here has already been provided in a recent publication (cf. Lankshear & Knobel, 1997, p. 142,

Table 6.1). The schema we propose here is similar, but extends over a broader reach, including literacy and learning practices focused specifically on "information" (processing, handling, storage, transmission).

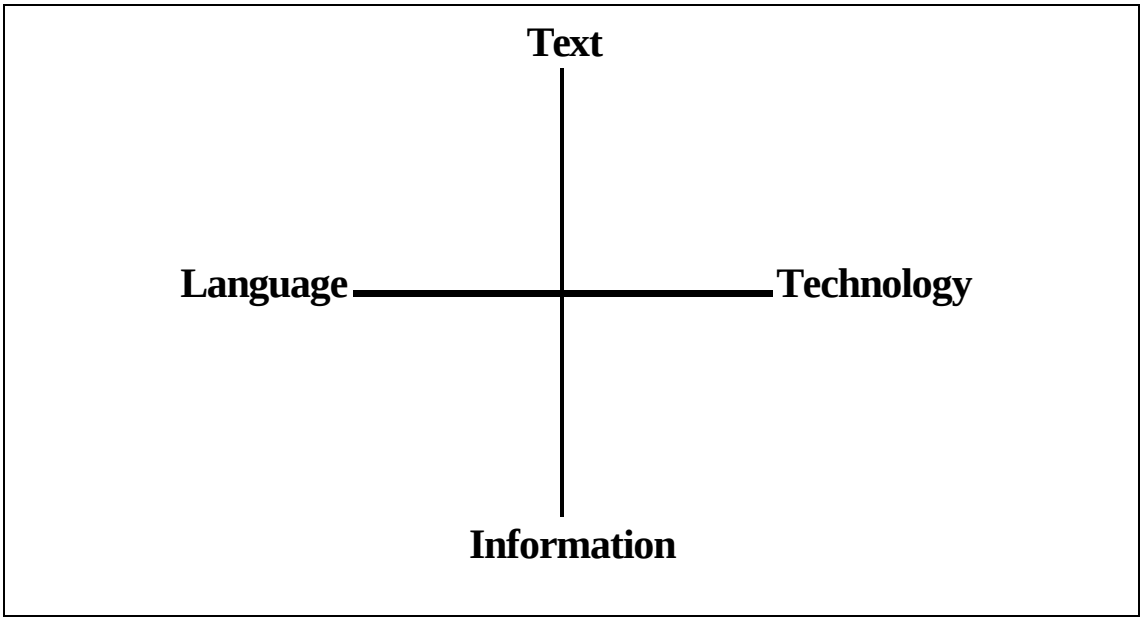


***Figure 3: Literate Practice***

In this context we suggest the following classification schema:

- *text*-based (or -oriented) computing/software—e.g., word processing, desktop publishing
- *information*-based (or -oriented) computing/software—e.g., database, spreadsheet
- *programming*-based computing/software—e.g., LOGO
- *games*-based (or -oriented) computing/software—e.g., *Nintendo, Myst, Carmen Sandiego*

(It should be noted that all are instances of programmed text—i.e., text that can be predetermined by a set of instructions—another text or program—to re-present text in a new/different form, often depending upon what the reader does in her/his interaction with the re-presented text.)

A further matter to consider here is the notion of a shift from "stand alone" to "networked" computing (Turkle, 1995). Historically, this is how the field has developed. The development may usefully be thought of in terms of anaugmentary shift from "information" to "communications and information" technology. The following figure provides a visual representation of the combinations of these different types of computing (text, information, programming and games) and the two key dimensions (stand alone, networked).

| | Stand alone | Networked |
|---|---|---|
| Text | | |
| Information | | |
| Programming | | |
| Games | | |

***Figure 4: Classification Schema for Computing***

This, of course, is at best a provisional and historically contingent framework, and should not be taken as a definitive account of hard and fast distinctions and categorisations. Once one begins working with it, and with different technologies as they become available (e.g., virtual reality technologies), overlaps become obvious. Hypertext/hypermedia and the Internet are especially interesting to consider in terms of where and how well they fit around such classifications. The point here, however, is to provide a useful starting point—particularly, one which can be useful for teachers—and the classifications offered here are advanced with that in mind.

*c. Technology and learning*

With this recapitulation in place, we can now take up issues related to Technology and learning, beginning with the issue of the disassociation of text and information.

Lyotard (1984) writes specifically with respect to new technological challenges and transformations as follows: "The nature of knowledge cannot survive unchanged within this context of general transformation [i.e., the "postmodern condition" which is so closely bound up with the triumph of information]. It can fit into the new channels, and become operational, only if learning is translated into quantities of information". The hitherto privileged status of the "inside"—"personal" knowledge—can no longer be sustained. For Lyotard, we now operate within an emergent educational techno-logic characterised by "a thorough exteriorization of knowledge with respect to the "knower", at whatever point he or she may occupy in the knowledge process" (Lyotard, 1984, p. 4). Knowledge, in other words, is "out there", rather than "in here". Information is contained with vast banks of data and information, which knowers "access". [Furthermore, what individuals "know" is itself increasingly to be put "out there"—via reporting, accountability measures, documentation against performance indicators, and the like. From this perspective we can see so much of what now characterises teachers' lives as bound up with the emergence of information technologies and aspects of the very dialectic between resource and context we mentioned earlier. New machines have become associated with new practices: we have the *means* to report and objectify through the production of endless flows of information, and our *context* of practice—the emerging *meaning* of so much of our practice—becomes increasingly one of gathering and reporting information. This change is often superficially explained away in terms of "economic rationalism", and

other similar slogans, without our recognising the extent to which the very discourse of economic rationalism is itself dynamically related to a larger dialectic within which information and communications technologies are absolutely integral.]

In the context of this "exteriorization of knowledge", the privileged status of the Teacher is thrown into question. With the increasing orientation toward data banks and other forms of information resourcing and exchange, we find people increasingly looking toward " . . . the partial replacement of teachers by machines" (Lyotard, 1984, p. 51). Quite extreme, but very influential, advocacies of such replacement can be found in the work of people like Lewis Perelman (1992), who would replace schools and teachers holus bolus with a high tech learning system - no further questions asked! It is very important that teachers generally, and literacy educators specifically, address some of this literature to get a sense of the issues at stake here. Perelman believes schools and teachers have absolutely no hope of adapting usefully and productively for the future, and looks forward enthusiastically to their being consigned to the dustbins of history. Lyotard, by contrast, is keen to identify and address the issues from a critical, analytical and theoretically informed standpoint. Nonetheless, he too is convinced that teachers and teaching as we have known them are inevitably headed for major changes.

Writers closer to literacy and education than Lyotard, Castells (1989, 1996), and others, are making similar observations. Papert's work, from his earliest account in *Mindstorms* (1980) to his more recent work in *The Children's Machine* (1993) and elsewhere, has consistently sought to move education away from what he sees as its thralldom to "curriculum"—its "instructionism"—toward a learner-centred view which, he believes, is significantly enhanced and enabled by digital technologies. His case of "Jennifer" is illustrative. Papert introduces "Jennifer" as a four year old pre-schooler, presently locked into the "letterate" world view. Her learning and development are constrained as a consequence. Yet, in the "future", she might well be able to bypass the gatekeeper culture of literacy, libraries and books, and with the assistance of a "Knowledge Machine" access a richer, more extensive and immediate world of information and experience. Moreover, she could do this on her own initiative and in accordance with her own will to knowledge, at her own rate (compare here the literature on self-directed learning). Teaching, as we know it, is unnecessary here. At least, it must be significantly reconceptualised, redefined, re-positioned. In Lyotard's words (1984, p. 50): "[p]edagogy would not necessarily suffer. The students would still have to be taught something: not contents, but *how to use the terminals* (our emphasis).

Other writers, like Jay Lemke, have explored various scenarios vis-a-vis literacy and education. Lemke considers the eventual displacement of schools. He proposes what he calls an "information paradigm", in opposition to a "curriculum paradigm", as the organising principle for the new education, In this, libraries (themselves reconfigured) serve as the dominant educational institutions in society, as education falls increasingly under "the interactive learning paradigm" (Lemke, 1996). It is important to note here the link between notions of "information" (and "information access") and "interactive learning". The larger shift envisaged by Lemke is from *teaching to learn* to *learning to learn*—from teaching to learning, and from Teacher to Librarian.

Developing an informed and critical perspective in and for the Information Age requires appreciating and engaging the educational implications of new social and semiotic conditions and practices: always a complex and contradictory matter. As we noted in relation to the resource and context model, positive and productive aspects need to be set alongside more problematic and negative aspects. For example, the fact that there is undeniably *more* information available now, and "access" is increasingly facilitated—which is, precisely, the promise of the new technologies—needs to be viewed in relation to pathologies and perils of information*excess* (Collins, 1995). Crucial issues here are taken up by Nicholas Burbules in Volume 3 of this report.

Yet, we cannot lose sight of the value of information, or deny its significance. We need to engage with it. Information is central to the new economy, as well as being the very "stuff" of life itself (as in the form of DNA). Information is also absolutely crucial to literacy: no information, no literacy (as argued earlier with respect to composing). But while necessary to literacy, information is not on its own sufficient. As the embodiment of *meaning*, "text" is necessary to literacy. Literate practice requires the integration of text *and* information. Both terms need to be richly theorised *and* realised in the light of information technologies and the new opportunities they afford us as resource and context.

Further light is shed on this and related issues in recent work by Lankshear, Peters and Knobel (1996), which takes up the question of "information" in relation to "knowledge" and "understanding".

In its traditional "western" formulation, knowledge has been conceived as "justified true belief". According to this conception, for somebody (A) to be said to *know* something (P—a proposition), three conditions have to be met: namely, A must *believe* P; P must be *true*; and A must have *good reason* for believing P (i.e., be *justified* in believing P). If we see P as containing information, then it is clear that on the historical account knowledge involves very much more than information. And, historically, knowledge has been regarded as integral to living *well*—justly, humanly.

The current obsession with information, however, makes earlier concerns with knowledge seem anachronistic. It is almost as if "now we have information, who cares about knowledge?". None of the conditions referred to in the justified true belief account seems necessary for information. For something to count as information it is not necessary for it to be believed, for it to be true, or even for a believer to have justification for any belief of it over and above the fact that it has become an item in the information bank. Rather, we have simply the engineering distinction between "information", on the one hand, and "noise" on the other (cf. Poster 1990, p. 14)—although there is some concern to distinguish information from "mis-information" and "dis-information". Mis-information is information that doesn't accord with the "facts", and dis-information denotes the act of issuing mis-information with the conscious purpose of misleading. The latter is intentional; the former not necessarily. When a hoax about a non-existent computer virus is written and emailed to users of the Internet, we could describe that as dis-information. When the hoax is unwittingly passed on to you by well meaning friends and colleagues (often resulting in you

receiving copies of the hoax months or years later), we could describe that as mis-information.

In computing and systems literature "information" is conceived as what results from data processing (its assembly, analysis). For instance Paul Beynon-Davies (1993, pp. 1-2) defines information in the following terms.

- Data is facts. A datum, a unit of data, is one or more symbols that are used to represent something.
- Information is interpreted data. Information is data within a meaningful context.
- Knowledge is derived from information by integrating information with existing knowledge.
- Information is necessarily subjective. Information must always be set in the context of its recipient. The same data may be interpreted differently by different people on their existing knowledge.

Benyon-Davies also talks of information systems in terms of semiotics, where the sign is considered as a convention linking the signifier (symbol) to the signified (what it is representing).

This, however, is highly problematic for anyone who retains serious concerns for ethical, cultural, political, and general "quality of life" matters that call for more than a (literally) mechanical distinction between information and "noise". In an important critique of limitations in the "engineering" approach - an account which brings us nearer to matters of text and meaning - Umberto Eco (1989) argues that

> information theory provides us with only one scheme of possible relations (order-disorder, information-signification, binary disjunction, and so on) that can be inserted into the larger context. . . .[ the scheme] is valid, in its specific ambit, only as the quantitative measurement of the number of signals that can be clearly transmitted along one channel. Once the signals are received by a human being, information theory has nothing else to add and gives way either to semiology or semanticism since the question henceforth becomes one of signification. (Umberto Eco, 1989, pp. 67-68)

The engineering definition of information reduces it to bits and bytes, but does not provide us with a theory of knowledge, a theory of signification, or a theory of meaning—all of which we need as literacy educators operating from a 3D perspective. Taylor and Saarinen (1994, Net Effect 4) warn that it is important not to confuse information and meaning.

Though not necessarily opposites, they are inversely proportional: as information increases, meaning decreases. One of the distinctive features of the information age is the proliferation of data whose meaning becomes obscure. The more we accumulate the less we have.

Or as Boal and Lakoff argue,

> [t]he view of information as something that is separate from human beings is an entailment of the conduit metaphor. It seems natural because that is our major metaphor for communication. (Boal & Lakoff, 1995, p. 117)

They illustrate the point in this manner:

> Let's suppose we have books on ancient Greek philosophy. Let's suppose we stop training people to speak ancient Greek. Suppose nowhere in the world can people speak ancient Greek and suppose no one learns ancient Greek philosophy anymore. Can you just go to those books in ancient Greek, about ancient Greek philosophy, and understand them? Clearly, the answer is no. So there is no information in the books per se. (Boal & Lakoff, 1995, p. 118)

Meaning, by definition, is the medium and outcome of social practice. Without a theory of signification we literally cannot make sense of our lives. Information yields data, but without sense that data is useless. Equally, we need some kind of epistemological theory that extends beyond information alone, otherwise all meaning-mediated information becomes of a piece, and the notion of an examined life is rendered unintelligible. That is, critique becomes impossible. In this context, Taylor and Saarinen (1994) argue that "in the . . . world of ultra tech the politics of critique must take a new form". Inhabitants of the info-tech world must become what they call media philosophers, who attempt "to move beyond existing institutions to imagine *and refashion* possibilities that **might be**" (1994, Media Philosophy, pp. 17, 20; our italics, bold in original).

This calls for *understanding*, in addition to information and knowledge. Taylor and Saarinen ask how we might create understanding in a world that desperately needs it, but where information and knowledge are out of control. Understanding "presupposes information and knowledge": yet information and knowledge "less and less lead to understanding". The challenge is to transform "institutional technologies dedicated to the production of information that is not knowledge to the production of knowledge that advances understanding" (Taylor & Saarinen, 1994, Communicative Practices 12-13).

These various ideas all point toward the importance of keeping in focus the fact that information, in and of itself, is not enough; that there is more to literacy (and to life, too) than simply *information*—particularly, as information is filtered through the metaphors and techniques of computer culture. In short, we need to envisage an educational ideal that transcends the demands of what is often called an "information society". Despite the deep issues inherent in the idea of an information society, it is rarely questioned and, in fact, is fast becoming "naturalised". Melody writes:

> In recent times the subject of the information society has captured the imagination not only of technologists and social scientists, but also the lay public. Seldom in our society has a subject attracted such attention

> and generated such volumes of literature, yet yielded so little critical insight and understanding of its real long-term implications. (Melody, 1994, p. 254)

Although this view is shared among numerous commentators (e.g., Roszak, 1986; Peters, 1988; Poster, 1990; Webster, 1995; Nunberg, 1996), it is arguably a minority view. The debate has major importance for education, which is now tightly caught up in futuristic rhetorics and digital dreams. In relation to this debate, Ransom (1992, p. 71) argues that there is an "urgent need for fundamental change" and "the creation of a new moral and political order", and locates learning at the centre of addressing this need. He adds that "the defining quality of such a new order, and the key to change, is a society which has learning as its organising principle" (Ransom, 1992, p. 71). This is a proposal to establish a learning society in the stead of the information society (Green, 1997a). With colleagues, in a later statement (Ransom et al, 1996) Ransom argues that "[t]he quality of our future will depend on our capacity to learn".

> Only if learning is placed at the centre of our experience will individuals continue to develop their capacities, institutions be enabled to respond openly and imaginatively to change, and the differences within and between communities become a source for reflective understanding. A new vision for education is required to express the value of and conditions for a learning society". (Ransom et al, 1996, p.25)

## *Learning*

### *a. Learning*

Indications are that schools, as they currently operate and understand themselves, are not well equipped to respond to this challenge. In their current-traditional form, schools may no longer be congenial to learning, let alone up to the task of spearheading the learning society.

The sociocultural perspective we have adopted has major implications for how we understand learning in general, as well as learning in relation to language and literacy more specifically. This has partly to do with the axiom that we can only understand language, literacy, and learning when they are situated in their larger social and cultural settings of practice. Beyond this, however, it has to do with the relationship between *school-based* practices and practices situated more widely in *the world*. While it is necessary to acknowledge the inescapable "socialsituatedness" of all literacy and learning, it is also necessary to pay close attention to the sheer diversity of "situatedness", and the relationship between "schoolsituatedness" and other situations of practice.

These wider contexts of practice can be understood in both "spatial" and "temporal" terms. By "spatial" we mean, obviously and in the first instance, their location beyond the school. This invites consideration of the school as a space, and school learning as "spatialised" in significant ways. By "temporal" we mean the location of school practices at particular points in time and, most importantly, their relationship to social

practices at later times within the learner's life course.

Some recent work (Lankshear, Peters & Knobel, 1996; Peters & Lankshear, 1996) has argued that the school can be seen as a quintessential "modernist space of enclosure", to draw on Deleuze's metaphor (Deleuze, 1992). This refers to a notion of school as a content for learning which is predicated upon prevailing fixed enclosures of the book, the classroom, and larger curriculum structures which, in Heim's (1993) metaphor, nest each within the other like a series of Chinese boxes.

> For example, we may see the typical enclosed classroom operating on a surveillance grid which maps educational space in ways that both individualize and normalize (cf. Foucault, 1977). Likewise, the book can be seen as an enclosure of space. A left-right, top-down, beginning-end set of orientations organises the book economy of writing space (Bolter, 1991). Consciousness based in these models is also enclosed, in the sense that it is spatialized to accommodate these cultural norms and preferences. (Peters & Lankshear, 1996, p. 53)

This has important implications for school learning. Curriculum based on recourse to the book as the central medium and mediator of knowledge and knowledge production constrains pedagogy in various ways. The book/text (and the curricular knowledge embodied in the book) often stands between the learner and the world. Learners' experiences of much of "the world to be known" is in danger of remaining "bookish": with the World being reduced to Words, and becoming "known" at the level of words. In addition, learners' own lived and material experiences have to be related to and filtered through books/texts, in order to have educational legitimacy and currency. The book, the classroom and the curriculum can be viewed as intermeshed fixed enclosures which operate in concert to separate educational engagement from wider spheres of social practice: substituting reliance on texts for an integrated experience of word in relation to world and, in the process, conferring heavy responsibility on the teacher to organise curricular activities and materials, and interpret meaning and experience.

The book has typically been seen to enclose meaning and experience and, thereby, to promise the possibility of bringing the world into the classroom. It is precisely this that underpins the project of educating learners for life in the world by means of an "age-specific, teacher related process" which requires "full time attendance at an obligatory curriculum" (Illich, 1973, p. 32). Likewise, the assumption that books and other texts enclose meaning, and that the task of readers is to extract this meaning, legitimates the role of teacher as the presumed authority on matters of interpretation and accuracy: the teacher "standing in" for the author and for the (experiential) world.

In "spatial" terms, what we think has happened is that the institutions of the book, the textbook, the classroom, the curriculum, and the school—all embodiments of modernist spaces of enclosure—have separated out a set of bounded social practices as "educational" and demarcated them from other sets of similarly bounded social practices based upon the institutions of the family, the workplace, the corporation, the law, the church, and the various political institutions of the public sphere. As a

consequence, it is often difficult to see how school learning—including school language and literacy learning—can be expected to make easy and ready transitions to other discursive domains. Equally, the enclosed character of schooling may limit the influence of outside practice on school-based learning.

So much for the issue of context as "spatial". What of it as "temporal"? Once again, the work of Gee and colleagues is relevant here. When we take a sociocultural approach to literacy we exit the mind and, ultimately, the school, and enter the world, including the world of work. On a sociocultural approach, the focus of learning and education is not children, nor schools, but, rather, human lives as *trajectories* through multiple social practices in various social institutions. If learning is to be efficacious, then what a child or adult does now as a "learner" must be connected in meaningful and motivating ways with "mature" (insider) versions of related social practices (Gee, Hull & Lankshear, 1996, p. 4).

This has crucial implications for school learning (Gee, Hull & Lankshear, 1996, p. 15). Learning—at least if it is not a senseless activity (which, regrettably it sometimes is)—is always about entry into and participation in a Discourse. Unfortunately, a focus on children and schooling tends to obscure the role of social practices and Discourses. Some Discourses, like law, have a separate domain for (initial) initiation into the Discourse (namely, law school). Others, including many Discourses connected to workplaces, do not engage in such a separation to any such extent. In these cases, much learning and initiation into the Discourse occurs "on the job". In both cases, however, the connection between learning and participation in the "mature" Discourse (law or work) is relatively clear. The same is true of family, community, and public sphere-based Discourses.

School-based Discourses are quite anomalous in this respect. Schools don't merely separate learning from participation in "mature" Discourses: they render the connections entirely mysterious. Schools and classrooms most certainly create Discourses, that is, they create social practices that integrate people, deeds, values, beliefs, words, tools, objects, and places. They create, as well, social positions (identities) for kinds of students and teachers. However, the Discourse of the school or classroom is primarily a Discourse devoted to learning—but, learning *for what*? Is it learning for participation in the school or classroom Discourse itself, or learning for Discourses outside school? Which Discourses outside of school? And what sort of relationship to these outside Discourses should (or do) school and classroom Discourses contract?

We are not advocating easy answers here, rather we are pointing to complex questions and issues. The separation between school-based Discourses and "outside" Discourses may be a good thing, or it may not be. It all depends on how we answer such questions as "What is the point (goal, purpose, vision) of school-based Discourses?" "What is the point (goal, purpose, vision) of this or that specific school-based Discourse—e.g., elementary school science or secondary school physics?" (For previous three paragraphs, see Gee, Hull &Lankshear, 1996, pp. 15-16)

It is important to note that we are at an historical conjuncture when school learning is increasingly under scrutiny in terms of its relationship to larger Discourses and larger

contexts of change—not least the world of work and the impact of new technologies and technologically-mediated practices closely associated with changes in work. Key questions for learning identified here, then, include: what is the relationship between learning in school and participation in social practices (that lie) beyond the school?; and what is the relationship between learning engaged in*now* (within the school) and participation in mature (insider) versions of related social practices at subsequent points in one's life trajectory?

When we consider social practices mediated by CITs the relationships between "in school" and "out of school" learning often appear tenuous. Students we meet out of school operating bulletin boards, designing, constructing and maintaining their own web sites, and corresponding with friends at a distance by means of digitally encoded voice messages—not to mentions those who find means of using the Internet free by recourse to phone phreaking/hacking procedures, and the like—experience considerable distance between what and how they learn within the classroom and what and how they learn elsewhere.

In addition to these "spatial" and "temporal" aspects of learning, there is an important "procedural/process" consideration which needs to be addressed as well. This arises in relation to Gee's (1996, p. 138) question of how people come by the Discourses they are members of. How do they become proficient in various social practices. We will draw on two sets of ideas here. The first is Gee's appropriation of Krashen's (1982) distinction between "acquisition" and "learning". The second is Heath and McLaughlin's account of learning within authentic contexts via processes referred to by Rogoff (1990, 1995) as "apprenticeship", "guided participation", and "participatory appropriation".

Gee speaks of acquisition and learning as two poles of a process continuum (rather than as a hard and fast distinction). Becoming members of Discourses/proficient participants in a social practice typically involves some mix or other of acquisition and learning, although the mix varies from case to case. Gee (1996, p. 138) distinguishes acquisition and learning as follows.

> *Acquisition* is a process of acquiring something (usually, subconsciously) by exposure to models, a process of trial and error, and practice within social groups, without formal teaching. It happens in natural settings which are meaningful and functional in the sense that acquirers know that they need to acquire the thing they are exposed to in order to function and they in fact want to so function. This is how people come to control their first language.
>
> *Learning* is a process that involves conscious knowledge gained through teaching (though not necessarily from someone officially designated a teacher) or through certain life-experiences that trigger conscious reflection. This teaching or reflection involves explanation and analysis, that is, breaking down the thing to be learned into its analytic parts. It inherently involves attaining, along with the matter being taught, some degree ofmeta-knowledge about the matter.

Acquisition and learning are "good for" different aspects of proficiency in a social practice. Acquisition is good for fluent performance, for *mastery*. Learning is good for promoting knowledge of the practice, for understanding what it is that one is doing. According to Gee (1996, p. 139)

> Discourses are *mastered* through acquisition, not through learning. That is, Discourses are not mastered by overt instruction, but by enculturation (apprenticeship) into social practices through scaffolded and supported interaction with people who have already mastered the Discourse (Newman, Griffin, & Cole, 1989; Tharp & Gallimore, 1988).

Although Discourses are mastered through acquisition rather than learning, they need a learning dimension—that is, they need to be subjected to explicit forms of analysis, critique, and intervention—if mastery is not to become simply a form of socialisation (or what Gee calls "indoctrination") into received cultures and ideologies. Learning is essential if the cultural and critical dimensions of social practice are to be realised. Hence, while teaching for acquisition precedes and has priority over teaching for learning in Gee's sense, the latter is crucial if cultural apprenticeship is to be appropriately balanced by cultural criticism—a matter, that is, of "acquisition" and "learning" worked in together.

Gee (1996) states the matter as follows, acknowledging in the process an important implication for equity:

> Classrooms that do not properly balance acquisition and learning, and realize which is which, simply privilege students who have already begun the acquisition process outside the school. Too little acquisition leads to too little mastery-in-practice; too little learning leads to too little analytic and reflective awareness and limits the capacity for certain sorts of critical reading and reflection (though, of course, only certain sorts of learning lead beyond mere conscious awareness and reflectiveness to an actual critical capacity). (Gee, 1996, p. 139)

As social life becomes more and more "technologically textured" (dhe, 1990, p. 1) it is necessary to reckon technologies of various kinds into social practices like literacy. At the same time, however, this "reckoning into" must account for both *performance* and *knowledge* dimensions. What is required, then, is a pragmatic view of pedagogy that explicitly brings together "acquisition" and "learning" literacy and technology as depicted in Figure 5.

In an account of what an "authentic" classroom curriculum might look like, Heath and McLaughlin (1994, p. 472) criticise classroom pedagogies which "create "authenticity" artificially rather than study contextually authentic curricula—authentic to youth—in supportive organizational structures". They argue that classroom educators can learn much from examining effective grass-roots organisations like the Girl Guides, Girls Club, and drama groups. These provide rich social contexts and opportunities for "learning to learn for anything" everyday by means of "[cognitive and social] apprenticeship, peer learning, authentic tasks, skill-focused practices and real outcome measures", such as completed public projects, performances, displays and

exhibitions (ibid.). Heath and McLaughlin believe these characteristic features of effective *authentic* learning converge in Barbara Rogoff's (1990; also Rogoff, 1995) account of learning through sociocultural activity.

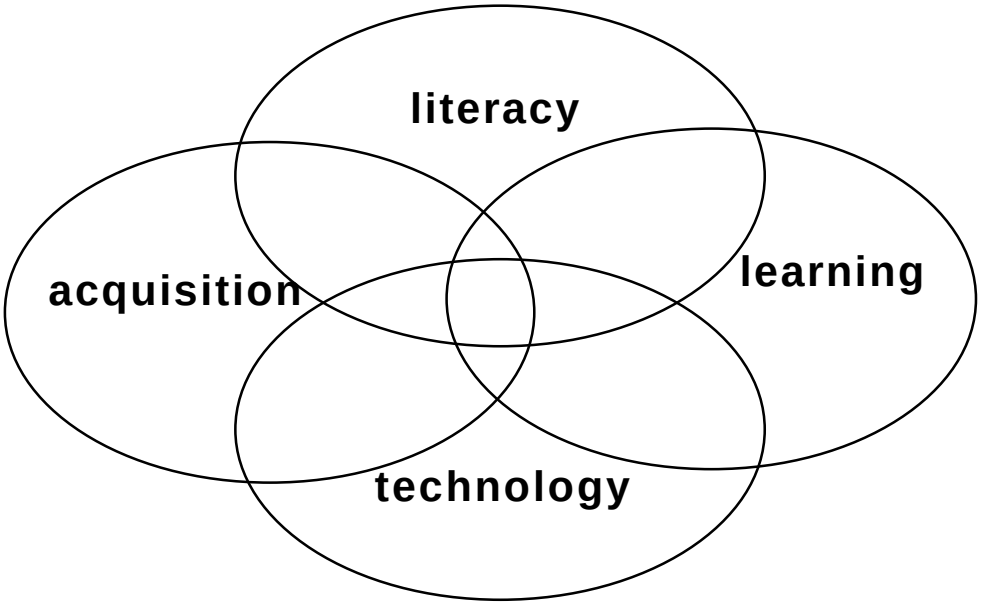


***Figure 5: A pragmatic view of pedagogy***

Rogoff advances three planes of analysis for interpreting and evaluating learning. These are apprenticeship, guided participation, and participatory appropriation. They correspond with community, interpersonal, and personal processes. While these planes are mutually constituting, interdependent and inseparable, identifying them individually enables particular aspects of a learning process to be brought into sharp focus for analytic purposes.

According to Rogoff, "apprenticeship" operates within a plane of community and institutional activity and describes "active individuals participating with others in culturally organized ways" (1995, p.142). The primary purpose of apprenticeship is to facilitate "mature participation in the activity by less experienced people" (ibid.). Experts—who continue to develop and refine their expertise—and peers in the learning process are integral to Rogoff's account of apprenticeship (Rogoff, 1995, p. 143). Both categories of participant find themselves "engaging in activities with others of varying experience" and moving through cycles of learning, teaching, and practice. Investigating and interpreting sociocultural apprenticeship focuses attention on the activity being learned (with its concomitant skills, processes, and content knowledge), and on its relationship with community practices and institutions—eschewing traditional conceptions of apprenticeship as an expert-novice dyad.

"Guided participation" encompasses "processes and systems of involvement between people as they communicate and coordinate efforts while participating in culturally valued activity" (ibid.). It involves a range of interpersonal interactions. These include face-to-face interactions, side-by-side interactions (which are more frequent face-to-

face interactions within everyday life), and other interactional arrangements where activities do not require everyone involved to be present. Hence, for Rogoff, guidance is provided by "cultural and social values, as well as [by] social partners" who may be local or distant (1995, p. 142; also Rogoff, 1984).

"Participatory appropriation" refers to personal processes of ongoing and dynamic engagement with learning through socially contextualised and purposeful activities that ultimately transform the learner. Rogoff uses this concept to describe processes by which people "transform their understanding of and responsibility for activities through their own participation" (Rogoff, 1995, p. 150). Here analysis focuses on changes that learners undergo in gaining facility with an activity, as well as acceptable changes learners make to activities in the process of becoming "experts", enabling them to engage with subsequent similar activities and their social meanings.

*b. Learning and literacy*

We do not learn language or literacy in a vacuum, but always as components of larger practices in which language and literacy are embedded. Increasingly, social forms of language and literacy are mediated by a range of new digital-electronic technologies. Indeed, these new technologies are associated with the emergence of forms of language and literacy that were unthought of even a decade ago. The language and literacy of Hypertext Mark Up Language (HTML) is a case in point. Similarly, there would scarcely have been a market for manuals of email style in the mid-80s, whereas now they approximate to best-sellers. The point here is that these "new literacies" are thoroughly embedded in larger social practices and cannot be "extracted" from them. They are parts of integrated wholes—albeit *new* integrated social Discourses and practices. The issue is how can we do a better job of enabling learners to acquire fluency in relevant new Discourses than we have managed within classrooms in the recent past with respect to conventional print-based literacies and their associated Discourses.

Researchers increasingly claim that current perspectives on literacy pedagogy in formal educational settings fail to take sufficient account of radical changes occurring in literacy practices within the larger social-cultural environment (Kress, 1993; New London Group, 1996). According to Healy (1996), current social and cultural change demands that language and literacy education be reconceptualised. Of particular relevance here are new communications technologies and the social practices associated with them, particularly computers—with which many children are becoming familiar from an early age: video games both at home and at commercial outlets and all forms of electronic communication that "create new environments for conducting social situations in which learning occurs" (Healy, 1996, p. 8). As Healy puts it, there is a gap between what key agents in "the larger cultural context" and key agents with respect to "classroom curriculum" see as important in social, cultural and historical terms.

Furthermore, while developmental and support work has been done to help promote classroom practices that interface with the changing technological universe and students' experiences of it, often this is seen as a matter of enabling teachers to use technology *within* existing pedagogies, rather than taking into account the

consequences of students having quite different, technologically constructed world views from those of teachers, curriculum developers, syllabus designers, etc. (Green & Bigum, 1993). A growing corpus of research suggests that learners may need very different classroom experiences from what they are currently getting, in order to utilise their prior experiences for language and literacy learning, and to be positioned realistically in relation to new learning activities and opportunities (Smith & Curtin, 1997). In many cases, this will presuppose placing much less emphasis on conventional print text materials. In part, it may call for greater emphasis on electronic texts and reading modes. In part, it may also involve greater emphasis on non-conventional print materials, many of which are influenced by text production in other media (Healy, 1996), such as fanzines, "Where's Wally?"-type comics, and so on.

If literacy learning is to proceed in ways that provide meaningful and motivated links between what young people do now as learners and what they become in due course as social beings, it is essential that current learning be linked so far as possible with mature versions of related social practices. This will require following clues provided by people like Heath and McLaughlin, and augmenting traditional classroom learning by pushing as far as possible also into authentic discursive spaces beyond the school. New alliances must be forged between schools/classrooms and other institutional spaces, so that valid contexts of acquisition and learning can be accessed within which relevant opportunities for apprenticeship, guided participation, and participatory appropriation beyond those offered by conventional classroom activity become available. These contexts should include learning spaces where young people's prior acquisitions can be built on in ways that have hitherto been marginalised for many learners by the selective nature of dominant "school"literacies.

There is nothing new here, since considerable work reported over two decades now by educators and researchers like Anderson and Irvine (1993), Cummins and Sayers (1995), Egan-Robertson and Bloome (1997), Heath (1982, 1983, 1991), Heath and Mangiola (1991), Heath and McLaughlin (1994), Irvine and Elsasser (1988), Moll (1992), Searle (1993), Thomas and Maybin (1997), and Torres (1997) has already indicated examples of where and how this has been done. Local examples are available in Volume 3 of this report (Doneman).. See also Knobel & Lankshear, 1997; Knobel 1997, 1998).

It is worth noting in this context that many current ideas about enhancing literacy proficiency by bringing the home and community into closer and more informed contact with the school does not go far enough. More to the point, it is too uni-directional. Ideas are often limited to making personnel outside the school more familiar with the cultural-institutional operation of classrooms, so that parents and others can become better equipped to assist children's learning in ways that bring greater success with classroom tasks. Without wanting to denigrate these ideas and related initiatives, we suggest that at most it is only half of the story. In fact, if our view of the current relationship between school Discourses and mature versions of related social practices is accurate, it is considerably *less* than half of the story. There is an even greater need for the schools, and school personnel, to extend *their* cultural contact and *their* conception of their role in learning *outwards* to where most of life is lived—and to take account, thereby, of *how* most of life is lived.

### *c. Learning and Technology*

In this section we draw on the experience since 1990 of two team members involved in teaching a distance education unit in educational computing: currently called "Learning the New Technologies". The unit's emphasis is on teachers' computer learning, but its informing ideas transfer with equal applicability to young learners. The unit has been expressly informed by the account of learning and language/literacy outlined in the previous section.

A key informing text has been Boomer's (1987) paper, "Technology, curriculum and learning". In this, Boomer writes:

> With any technology past, present, or future, we can conceive of three ways of dealing with it in the curriculum: 1. Learning the technology (e.g., learning the techniques of video filming); 2. Learning *about* the technology (e.g., study the video industry and art forms); 3. Learning *through* the technology (e.g., learning about biological interdependence by making a film on pond life).

Technology learning is understood here in terms of three interrelated aspects:

- learning technology (i.e., "how to");
- learning *through* technology;
- learning *about* technology.

We see the parallels between learning and language/literacy and learning and technology as more than simply analogous. Our view is that there is a necessary link between language/literacy learning and technology learning, between language and technology and their conjoint implications for an impact on learning. This constitutes a whole new pedagogic and research agenda, opening up possibilities for intriguing new alliances.

A further formulation is based on work by Cambourne (1988) in the area of literacy education which employs a set of principles for "natural language learning". These principles inform the construction of a curriculum environment involving the following conditions:

- immersion
- demonstration
- expectations
- responsibility
- use
- approximations
- response

These principles attempt to take into account the nature of language learning as *enculturation* i.e., the socialisation of learners into existing sociocultural formations, on the understanding that learning language is learning culture, and vice versa. They can be seen as bringing together four kinds of learning: *enactive* learning, *iconic*

learning, *verbal* learning, and *environmental* learning—put simply, learning by doing, learning by watching, learning by using verbal language (speaking, listening, writing, reading), and learning by being immersed in a certain environment over an extended period of time. The best learning situation is one which combines all of these.

Cambourne subsequently suggested that these conditions should be seen as relating to "a model of acquisition learning" (1989, p. 20). The similarities with Papert's (1980) theory of computer technology learning is striking. Observing that "the model of successful learning is the way a child learns to talk, a process that takes place without deliberate or organised teaching", Papert (1980) suggests this has important implications for computer learning.

> Two fundamental ideas run through this book [*Mindstorms*]. The first is that it is possible to design computers so that learning to communicate with them can be a natural process, more like learning French by living in France than like trying to learn it through the unnatural process of American foreign-language instruction in classrooms. Second, learning to communicate with a computer may change the way the other learning takes place. (Papert, 1980, p. 6)

Linking computer learning directly to mathematics (in itself something worth thinking about with regard to understanding computing culture, at least as it has tended to evolve to date), Papert goes on to propose that "[t]he idea of "talking mathematics" to a computer can be generalised to a view of learning mathematics in 'Mathland"; that is to say, in a context which is to learning mathematics what living in France is to learning French" (Papert, 1980, p. 6). What is most immediately relevant here is than an argument can be developed that Cambourne's learning conditions might well be mapped readily onto computer learning. This, of course, is to reiterate the significance of much of Gee's account of *mastering* Discourses through acquisition.

It does not, however, speak obviously and explicitly to the cultural and critical aspects of learning computing which, on the position we are advocating here, is a troublesome omission. Thinking about computing and computer competency—what Green (1996) calls "computency" or "being computent": a new literacy—in terms of Discourse or a family of Discourses, suggests the following.

The *operational* aspect of computency focuses on the computer technology itself, and involves developing an active, operational sense of how it works.

The *cultural* aspect relates more specifically to the specific knowledges and contexts that computer-based technologies are used in, and in relation to. In the case of schooling, this would include, notably, the actual school subjects. Here again, Gee's account of Discourse (1990) is very useful for understanding the cultural dimension of computing and computency.

> Discourses are ways of being in the world, or forms of life which integrate words, acts, values, beliefs, attitudes, social identities, as well as gestures, glances, body positions and clothes. (Gee, 1990. p. 142)

What does computing appear as when construed as Discourse? Or what is someone like who is "computent"? What do they do? What can they do? How do we know? What makes them distinctive or different in this regard? What marks out this dimension of their overall identity and, to that extent, from other people who are not in the Discourse? How did they get to be that way? If we take Gee's metaphor of a Discourse as a "sort of "identity kit" which comes complete with the appropriate costume and instructions on how to act, talk, and often write, so as to take on a particular social role that others will identify" (1990, p. 142), we can perhaps approach the cultural dimension of computing-computency in terms of what a person does, or can do, when they are faced with a computer, scanner, modem access, etc. Possibly, even, how they sit. And *certainly*, how they *talk*. They *do* speak a distinctive language, often (Green & Bigum, 1993).

Understanding the operational and cultural dimensions of computing in terms of this notion of Discourse provides a way of integrating, on the one hand, the development and consolidation of specific skills and capacities, and on the other, the sense of being an *insider*, as becoming part of the local scene or environment. As Smith and Curtin (1997, p. 229) observe, "the new literacy, referred to by Green as 'computency" . . . demands a style of relating to computers and, moreover, the connection of the technology to "a constellation of cultural associations" (Turkle, 1995)".

The *critical* dimension of educational computing might be seen as involving both internal and external elements. As internal critique, a critical stance will involve understanding and assessing current practices, values, beliefs, etc., in terms of commitment to the Discourse more or less as it is. This is akin to, say, journalists trying to contribute to enhancing their practice from within. As external critique, adopting a critical stance involves standing outside the Discourse(s) of educational computing and understanding and critiquing it/them from some other discursive-ideological perspective. The object of external critique will always be to seek to transform the practice in accordance with a larger set of purposes and values than those inherent or inchoate in the Discourse "itself". This does not necessarily mean *overthrowing* the Discourse. It does, however, imply more than simply trying to shore the Discourse up from within its own terms of reference. The critical dimension includes, among other things, taking into account the social and historical frames within which educational computing has emerged and currently operates. Hence, it involves seeking to understand the contexts within which current forms of educational computing are meaningful, and to contribute to enhancing social practice as a whole by acting in and/or on educational computing Discourse in accordance with this understanding and the standpoints from which it is attained.

This is in line with Gee's view that one cannot critique a Discourse wholely and solely from the inside. To develop a more detached, outsider perspective, one needs to draw upon the resources of other Discourses, other ways of thinking and seeing. This requires understanding the Discourse of computing as both enabling and constraining, and endeavouring always to think and operate somewhat across the grain with regard to computing.

# Chapter Three

# SCHOOL SITE STUDIES OF LITERACY, TECHNOLOGY AND LEARNING

## *Aim*

This synopsis provides a summary of site studies undertaken as part of this project. The full text appears in Volume 2 of the report. The synopsis highlights issues and implications found across the study sites and provides the reader with the flavour of current school practices with communication and information technologies in relation to language and literacy education across the curriculum. Each site study is described in the first part, "studies at a glance". In the second part, the issues and implications for education derived from findings in these site studies are summarised. Issues are organised in terms of three broad patterns—complexity, fragility and continuity—and four principles—teachers first, complementarity, workability, and equity (Bigum & Kenway, 1997). The final part of the synopsis lists several recommendations that come out of analysis of the implications.

## *Eleven Studies at a Glance*

*Abbotsdale: Theory informed practice in a Year 5 Classroom*

At Abbotsdale, a Year 5 class operates as a community of learners on cross-curriculum theme-based units of work, where new technologies are integrated seamlessly into activities which have been designed to provide focused language and literacy education opportunities, as well as to extend language and literacy competence across the curriculum. The school has well-developed technology and language policies. The Year 5 teacher, Robert, has a strong theoretical grounding in constructivist learning theory, is well informed about the English P-10 syllabus, and is very much at home with new technologies. His classroom is equipped with three computers with processing speeds equivalent to 486 and 586 PCUs. Two are fitted with quad speed CD-ROM players, and the third is linked to the Internet via a local public provider.

Practices in this Year 5 classroom are characterised by an emphasis on learning *through* technologies whilst learning *about* technologies. The pedagogy is strongly informed by theory. A mix of conventional and innovative approaches to teaching and learning are employed to integrate use of computer technology into activities. Robert describes new technologies as providing new contexts in which to learn. He insists that the technologies in his classroom not become ends in themselves. Instead, they are employed in ways designed to maximise learning in general, and the development and practice of higher order thinking skills in particular.

The principal strategy for embedding new technologies in classroom language and literacy education is via a theme-based approach to cross-curriculum planning. Robert carefully incorporates real-life and life-like learning opportunities and resources for his students into classroom language and literacy events. For example, life-like learning experiences are engaged when students are required to design and produce—using desktop publishing software (*Microsoft Publisher*)—a poster advertising their movie and invitations to the movie's premiere in addition to constructing scripts for their group's movie made using Microsoft's *3-D Movie Maker* software.

The Abbotsdale case highlights the value of teachers informing their practice with mature and cogent theory. It also illustrates the benefit of the teacher possessing a grounded familiarity with computer technologies, especially to accomplish specific curricular goals in the context of a classroom with limited computer resources. Finally, this study shows the value of a school having a coherent, comprehensive, and integrated technology and language policy.

*BushNet Schools - Uneven Potential*

This site study is unusual in being less geographically bounded than others. As a wide area network it links up more than twenty schools scattered across 6000 square kilometres of Far North Queensland rainforest and dry bushlands. The BushNet schools range in size from small single-teacher schools to a rural school with 600 students. The network not only links up schools to one another; it also provides a website for the schools' home pages and associated pages and access to the Internet. While BushNet enhances communication and connects the schools, policies and practices relating to education are developed within individual schools, and there are marked differences between one school and another and between one classroom and another within the same school.

Three schools, two primary and one secondary, some of whose teachers have most actively taken up the opportunities provided by BushNet, are the focus of the study. Each has given a rather different spin to the opportunities offered by the online technology in doing exemplary work with students.

Several snapshots into the classrooms are provided in the full text report in Volume 2. A typical example is provided here in abbreviated form. Year 5 students have logged on to the web and accessed the site for the Solar Car Race, at that time in progress from Darwin to Adelaide. They are checking the progress of the cars with keen interest, because they have entered a contest and hope to win the $300 prize to put toward the class computer fund. The following day, the race is over. Before school, two girls are searching the web site for the winners' times, to check how close their calculations were. But, the unofficial results have not been updated since yesterday, and the official results link ends in a blank page. The teacher suggests that one of the girls, Breanna, could email the website manager, which she does.

Following Breanna back into the main classroom after sending her email, the following occurs. The teacher is reading aloud from *Sophie's World,* by Jostein Gaarder. This

is a challenging novel for adults, combining as it does a mystery story with an extraordinary tour through the history of Western philosophy. The teacher is feeding it to the class in digestible mouthfuls and setting the students to write their thoughts in response to selected statements. The ironies of this contrast are striking. On the one hand, in the race results, knowledge is presented as facts external to oneself but always accessible through the technologies. On the other, in the reading book's argument, wisdom is presented as an internalised belief in the boundaries of our understanding. Such divergences have to be negotiated by the students through their literacy practices in this classroom. This is far from being a bad thing, provided that the education of these students continues to provide both the richness of such acculturation and the critical faculties to compare and evaluate the competing ideologies.

The BushNet study shows the potential of the new technologies to enhance, extend, and redefine students' literacy when they are used in sound ways by innovative teachers. It gives, however, a patchy, somewhat contradictory account of practices and how fragile their continuance can be if it depends on a few enthusiastic individuals.

*Castleton: Computer basics makes for competent, confident Year One students*

This large school, located in a relatively low socioeconomic area of Sydney, has a focus on technology. The principal, who is keen to integrate the use of computer and information technology throughout the curriculum, is an enthusiastic user of new technologies giving encouragement and support to staff, parents and students alike. Maggie, the computer coordinator, whose Year 1 class is the focus of this study, has the benefit of continued support from the principal and school executive together with access to relatively new hardware and software.

The thirty students in Maggie's class spend each day with their peers from the adjoining class, the dividing wall folded back to make one large area with sixty students and two teachers. A striking feature of this arrangement is the orderliness of the students as they move from activity to activity throughout the day forming and reforming groups across the two rooms. The study focuses on the use of the one classroom computer shared between sixty students. When all students interviewed tell you that they use the computer "all day" in their learning it's obvious that much careful work has gone into planning and programming.

Maggie's practice has changed considerably since she began teaching. Ten years ago she was doing mostly drill and practice and rote learning. This approach in the classroom was exemplified by a dependence on commercial texts and on predominantly whole class work including copying from the chalkboard. Although commercial software has taken the place of some of the commercial texts, unlike texts the software is modified to meet class needs. However, it brings with it the need for a different set of basic skills. Maggie now includes keyboarding in the curriculum. To support the changes, and partly as a result of using computer technology, Maggie involves peers and parents as tutors for her students.

Maggie's students are confident and competent users of the school's networked computer system. From the beginning, they learn how to manage their files and make use of the wide variety of software on offer. They also have very firm ideas on what constitutes work and what, in their opinion, is play. The computer environment supports all of the learning advantages of play which have beenrecognised in early childhood programs for many years. According to the students interviewed, like play, the computer provides an environment free from the fear of being wrong; it is intrinsically motivating; they can set their own goals and make up the rules. Even with some of the more structured software students have choices of entry level and can participate in the task or "game" at their own pace and for their own purposes. There is active engagement in the task and, in many instances, students select with whom they use the technology and for how long.

Teachers such as Maggie are highly motivated and reveal a tenacity and interest in developing their own familiarity with new technologies and how they might be applied to the classroom setting. Maggie's enthusiasm for new technologies has come to some extent from teacher development programs, colleagues, and a husband who has similar interests. But without the principal's vision of the role of computer and information technology in student learning, and support for teachers and students in learning with and about technology, Maggie would not have had the opportunities to pursue her own exploration of technology in the classroom (a theme that resonates with many of the other site studies).

*Ealing Grammar - A site of computer integration*

At Ealing Grammar, the words "curriculum" and "learning" always come before "technology". The Principal, the Head of Computing, the Curriculum Coordinator, the Head of Information Technology and the English teachers all view a technology-driven approach to the use of technology as anathema. They argue that the use of technology must always be justified in terms of curriculum needs—closely connected to curriculum design and its ongoing development. Effective student learning is the ultimate goal and this is achieved through careful curriculum planning. Thus, intrinsic to the school's philosophy are the notions of curriculum and learning. Only then is the use of technology added (Boomer, 1987).

This site study focuses on a Year 7 technology project, now in its second year of operation. The project's aim is to contribute to an overriding technology curriculum objective at the school: to equip all students by Year 10 with a comprehensive range of computer skills and competencies as well as familiarity with a number of computer applications. Thus, the Year 7 project is part of a larger plan for computer integration within the curriculum.

The project itself is cross-curriculum with students creating multimedia texts in Art, History, Geography and English. So that the teachers will be active participants and contributors, they are prepared ahead of time. They attend professional development sessions at the school to learn how to use the technologies. Further, when they accompany their students to the computer laboratories for the term which each curriculum area devotes to the project, extra technical support is available.

Although the push at this school for the development of dexterity with technology has come from the computer teachers and specialists, as a group, the English teachers are beginning to consider the implications for literacy practices. However, they are also the teachers who have been reluctant, expressing concern about the extra demands put on an already crammed curriculum (Snyder, 1996). With the current multimedia project, they feel that the multimedia demands take away time from the real business of English: writing and the study of printed texts. In an effort to address this difficulty, the English teachers are going to be involved in a project next year using hypertext webs with the emphasis on creating texts and hyperlinks. The rationale is that here the emphasis will be on the development of texts, but texts with links. The Head of Information Technology sees the use of hypertext as representing great significance for the teaching of English—part of the challenge is to convince English teachers that this is the case. However, despite all the efforts by the leaders in the school, the eleven English teachers had to be persuaded to participate in the multimedia program. The Head of English depicts some of the English teachers as "a bit suspicious".

There is much to be learned from this school's approach. Probably the most significant feature is the whole-school policy that has been extraordinarily carefully conceived, planned and implemented. This is a school that has found solutions to many of the problems that continue to plague other settings: strong leadership, careful planning, excellent resources, school ownership of the technology, mutually effective links with the corporate sector, easy staff access to technology, in-house professional development. Perhaps, most significantly, the notion of "fragility" does not seem to apply to this particular context—even if one of the three leaders left, it is doubtful that the technology curriculum would collapse. The explanation is that it is not person-dependent. Rather, extending the use of the new technologies across the curriculum is so deeply imbricated that it will continue no matter who departs.

*Elmwood: Technology in transition as a key learning area*

Elmwood is a large suburban high school in a mainly middle class area. This study considers literacy practices in the context of a Year Nine Agri-Technology class. The focus here is on technology as a key learning area (i.e., subject Technology) rather than on the use of new technologies*per se*. The specific learning context is a Garden Project to be undertaken at home.

The Garden Project involves students in designing, making and appraising a home garden project. This garden must accord with home and family needs and circumstances. The teacher, Victor, requires students to establish the garden at home, after discussion and negotiation with parents. It involves a wide range of language and literacy practices—oral and written—within the classroom and at home. These include negotiations at home about the kind of garden to be constructed; talking and thinking around the design of the project; considering the balance between budget requirements and what the garden would yield. Victor's purpose here is to engage students in setting about the process the way "real practitioners" do in "real life". In addition, students complete a range of worksheets, maintain a diary, and complete an oral presentation of their project in class.

Three characteristics stand out within Victor's conception of technology as a way of thinking about and operating in the world. The first is his emphasis on the process aspect of technology: i.e., technology as a way of getting things done socially and culturally (cf. Franklin, 1990). The second is his notion that the literacy tasks completed within this subject area could be applied and transferred to other curriculum areas. This follows from his emphasis on technology as process rather than as content alone. The third is the way Agri-Technology, as exemplified in the Garden Project, is actively pushed by Victor beyond the confines of the classroom, and indeed, beyond the school. This is because of his concern that technology as social practice should be grounded in the overall context of human life, and not be seen as merely one component of school learning. Victor's rationale for locating the Garden Project at home is that the technological point of view should infuse people's approach to life as a whole.

The account of Elmwood offers interesting possibilities for literacy across the curriculum, and for expanding the range of literacy activities within other subject areas, e.g., Science. It raises the question of the relationship between school-based literacies (and the social practices in which they are embedded) and "mature" versions of social practices in the wider world. A poignant example of the costs in terms of learning that arise when literacy is abstracted from mature forms of discourse is provided. The potential for developing and making explicit the cultural and critical dimensions of literacy within the context of Technology projects like the Garden Project is also taken up. Finally, the importance (particularly for resource-poor schools) of thinking about technology and literacy from a wider perspective than the application of "up-to-the-minute electronic technologies" is addressed.

*Facing the challenge in a remote rural region*

This study investigates three geographically remote schools—two primary classes (Tipping and Manjerra Schools) and one Year 9/10 setting (Danton High School)—within a single administrative region. The schools form a loose cluster in that they are served by the same Learning Technology Education Adviser (EA), Georgia, who was working with students and teachers using Hypercard, CD ROMs, email, video, digital cameras, and word processing/publishing software. The account focuses particularly on how participants faced the challenges of limited local knowledge and equipment, unreliable Internet access, and restricted access to the EA—who served a very large area, and upon whose great energies and commitment each site relied heavily.

The EA taught students elements of operating a range of technological applications she and the teachers believed would be important in students' future lives. At Tipping, the Year 5/6/7 class produced a Hypercard presentation of biographies of Olympic athletes. The Year 5/6/7 Manjerra class undertook a Hypercard project structured as an information report on an environmental issue. At Danton, a group of Year Nine and Ten students worked with the Business Studies teacher and the EA to produce a Hypercard prop for the Principal's end of year speech.

As well as providing equipment, Georgia (the EA in this study) also provided technical advice about software and hardware owned by schools, conducted lessons for students and teachers on how to use particular software and hardware, arranged

swaps and exchanges of equipment and advice between schools, conducted in-service sessions for teachers at the support centre. All three teachers, and other teachers at the schools visited, relied heavily on Georgia for professional development and all kinds of technological advice. The fragility of this relationship was underscored, at the time of this study, by the news that Georgia had been transferred out of the region, back to a classroom teaching position for the next school year. All teachers mentioned this transfer, and were aware of its implications for their work. They all spoke of Georgia's commitment, after hours work, and professional dedication, and expressed concerns to do with furthering their technological expertise.

At Tipping and Manjerra this study documents a pedagogical approach that is common to multi-age classes, especially in small schools where there may be only fifteen to twenty students in a Year 5/6/7 class. Learning is largely self-directed, with activities designed by the teacher for individuals or small groups of students. These groups are not necessarily based on year levels. More often they are determined according to individual students' needs and abilities. Peer tutoring is encouraged within these groups, in accordance with the knowledges and prior experiences of group members. The teacher works as facilitator, guide or tutor. There are few whole class lessons. In primary classes, a unit of work is developed that centres on a common theme or topic, and activities and lessons appropriate to each age/year/ability level are then designed around such a theme. This approach requires handling of the different learning objectives (content, skills, processes) from the different syllabus requirements for each year level within the class.

The Manjerra students took the use of new technologies for granted. Many have had computers in their classrooms since preschool. Whether computers were used for skill and drill games, publishing "stories", or for downloading information from the web seemed to matter little to the students. They saw them as quick, efficient, and accessible tools. The students saw the purpose of the new wave of technology—especially CD-ROMs and Internet access—simply being to provide information that was more accurate and up to date than that found in library books and equivalent resources. Mary, the teacher, and the students saw a hierarchy of values among sources of information. Mary directed students to books in the library as the first source of reference. But the information was often out of date and irrelevant. In such cases, the commercial CD-ROMs (e.g., *Encarta* and *Australian Endangered Species*) were the references to be explored. Further, specific or up to date information could then be found by way of the Internet, either viawebsites or through email exchanges. The learners make their choice, opting for the computer where they believe it offers the most up to date information.

This site study documents positive aspects of practices that produced impressive levels of enthusiasm and dedication; the use of word processing at all levels of text production rather than reducing computers to a mere publishing tool; explicit use of key features of the English syllabus within projects; and the attempt to use presentation software in ways that resemble mainstream uses. Issues included *fragility*, in terms of equipment and human resources alike. Questions were also raised about *complementarity* with respect to developing and adopting critical perspectives toward information gathering and the use of information technologies;

and tendencies for participation to appear fragmented at times, as a consequence of teachers and learners having to work to tight schedules associated with limited availability of the EA and specialised equipment.

*In splendid isolation: Caldwell Primary School*

At Caldwell Primary School, twenty-five students and their two teachers have created a community of practice that might be identified as fitting comfortably into Rogoff's (1990) notion of guided participation. The methodology comprises a mixture of structured teaching tasks and group and individual work that facilitates the transfer of peer knowledge and skills.

Basic Skills and literacy levels are terms that are heard regularly in the office building. The difference between this school and many others with a similar focus, however, is that here there has been a deliberate attempt to shift the students'—and indeed the whole community's—perception of how technology might feature in a quite natural way in achieving success in such programs, though not in a technologically determinist manner (Medway, 1993). While actual school tasks do not appear to translate into real life activity (McCormick, 1995), there is genuine enthusiasm for learning activities in this school, and a strong sense of what schooling means for the students' futures.

Initial resistance to the introduction of computer technology to Caldwell Primary School was from parents who felt that their children would know more than they did about the technology. While this fear has been allayed to some degree, a number of parents still remain wary about their children's access to computers and their educational benefits. Teachers believe that informational technology will increase reading skills because students are motivated to use the technology which then requires reading skills to operate it. While continuing to instill traditional literacy skills in students, Caldwell's teachers employ the new technology to achieve this and think this kind of blending of the new and the old is quite successful. They note that process writing has gone ahead in leaps and bounds since word processing was made available and there has been a dramatic increase in student writing output.

The Caldwell case highlights the problems of many Australian schools that are geographically isolated. Teachers must overcome the difficulties of collegial isolation and distance-provided professional development support. On the technical side, the installation and maintenance of equipment, especially the telecommunication lines needed, is a constant problem—expertise in the latest CIT (Communication Information Technology) technical aspects is often difficult to access in these regions.

*Multimedia support for multicultural students at Carlisle Primary School*

Two teachers in two different classrooms at Carlisle Primary, a large, multicultural public school in western Sydney, embarked on a study of the role and status of technology in literacy and language teaching and acquisition. Over ninety percent of the school population come from non-English speaking backgrounds.

The first class, Year 2, prides itself on ownership by students as much as by the teacher. Doug, a teacher of nine years experience, remembers a time when computer technology was virtually nonexistent in classrooms and has now a firm commitment to investigating and implementing ways for students to use computer information technologies to access and present information. The study shows the students engaged in using computers to prepare a slideshow with an emphasis on problem solving through negotiation. It is a study in which students are seen to be involved from the initial planning phase, including identifying the audience, through to the drafting and editing phases which will yield a completed text.

Doug believes that computers are tools for students to access information and present their own information. He believes that they are an important part of the future and help develop divergent thinking strategies; that they provide access to different ways of writing and reading and investigating; and finally, that these technologies should be made available to students as a normal integrated part of their lives as they are another way of extending the knowledge they have and ensuring equal access to opportunities beyond the classroom (New London Group, 1996; Lankshear, 1997).

The second class, a Year 5/6 composite class, encourages students' "unselfconscious use of home languages" and fosters pride in bi- or multilingualism. Kathy, the teacher, acknowledges changing her pedagogy to accommodate the changing literacy demands experienced by her students. This study shows one way that a teacher organised a teaching learning program to integrate computer technology throughout the day and to have students take control of their own learning. Throughout this process the students are completely absorbed in the creative task. They experiment, change things, incorporate new ideas and reach agreement on the final version. Within the parameters of the set task there is room for play. As in play, students are in control of the process and product, they make their own rules for participation and choose with whom they will participate. They play until the "game" is finished and express great satisfaction with their end product. The activity brings with it intrinsic rewards.

Kathy hopes to show students that computers and information technology will be an integral part of their lives. She expects her students to make responsible choices about the use of technology and to share access to scarce resources. Consequently there is no computer roster. Instead students make decisions about how they will present work to an audience. This could be through a *Kidpix* slideshow or presentation from their easel including word processed texts.

This site study illustrates issues involved in ensuring access for all students to computers. Students often have control over when computers are used, for what purpose, with whom and for how long. Those with computers at home can continue learning in a play environment—experimenting; exploring; immersing themselves in the environment, learning the language and culture of the space as well as learning the skills necessary to participate. However, those with access only at school may well learn that computers are for something else—final copy of the report, or the constructing of a data base in history—school tasks, an intellectual exercise with little relevance to the outside world.

*New Park Primary*

New Park Primary possesses the following characteristics: a modest but increasingly stable school population; diminishing resources and the absence of a sufficiently wealthy school community to subsidise them; a dedicated, but frustrated principal who wants to make major changes, but cannot, because of inadequate funds; special needs that cannot be accommodated within a constrained budget; over-burdened teachers who are not skilled in the use of the new technologies; limited technology facilities and minimal access to the Internet. Some teachers feel comfortable and confident with the use of computers for literacy purposes; the rest take their classes to the computer laboratory for the one lesson per week scheduled on the timetable. More often than not, students use the computers to transcribe work already drafted in writing, or teachers invite them to choose a CD-ROM from a small collection and spend the lesson playing with it.

Despite these somewhat disheartening features that this school shares with many other Australian primary schools, two particular characteristics make New Park interesting in the context of this study. First, its multicultural student body composed of ninety percent from non-English speaking homes, with a significant proportion having arrived over the last few years. The language needs of the students is identified by the principal as a major priority area—improving students' English is central to the school's charter. Second, of a staff of twenty-three teachers, only two are overtly interested in the uses of the new technologies for teaching and learning. One is Chris, the teacher in charge of computers in education, and the other is Stephanie, the Year 4 teacher, whose work with multimedia provides the focus of this site study.

Chris sees language as the central concern of the school and that computers provide a catalyst for students to speak. Talk is promoted as the students usually work in pairs except if they're word processing. His view of the use of computers to promote talk as intrinsic to their educational value is supported by a number of major studies carried out in the UK (Scrimshaw, 1993; Fisher, 1994). Chris believes it doesn't really matter what program the students use, their language develops if they're solving problems together. If the students are interested in the activity, it seems to generate talk.

Stephanie describes her focus as the connections between computers and curriculum—"whatever will help the students". She also likes to use the term "learning technology" as it distinguishes what's happening now in schools from the associations people have made in the past with the role of computers in education. She's also careful to use the word "learning" rather than "teaching". She explains that the computer doesn't teach students much. Rather, the children use the computer to manipulate ideas within a particular framework. So even with the rapidly changing technologies which students have to learn how to use, what happens mainly in her classes is the use of computers as a "vehicle for ideas, like using a pencil, or paint or a camera". Just like these other technologies, computers require the accumulation and the manipulation of more skills. Users add more skills as they go, more complex skills. Multimedia, she says, is very complex.

This site study demonstrates that, within a multicultural context such as New Park, with its very special needs, it is possible to enhance the literacy skills of at least some of the young students with the use of multimedia technology. It also illustrates that the move towards technologising the curriculum which are energised and sustained by just a few key people do not hold much promise for institutional change.

*New technologies, old timetables: The difficulties of embedding computer use across the high school curriculum*

This new technology high school is situated in a rapidly growing middle class area of Sydney. The principal and staff have a reputation beyond the school for their willingness to share expertise and for their innovative student programs, especially their links with business and industry.

The school has also been willing to explore the relationship between technology and literacy with one member of the teaching staff—the support teacher—who was awarded a year's leave on full pay to research the benefits of computers to secondary school students with learning difficulties. The support teacher works closely with Alison, who teaches English, and is the focus of this site study. Alison refers to herself as one of the computer generation and feels that she could not work without her own machine at home for lesson preparation. Her classes (Years 8 through 11) benefit from this confidence and her willingness to find ways of accessing the school's computer resources. Her students are confident and articulate and enthusiastically debate societal issues associated with computers and information technology.

Alison is in her third year of teaching English. She sees her role as helping students develop their own skills in literacy, reading, writing and media. She uses computers every day for all preparation and marking and can't envisage doing these tasks without the benefits of a computer. Alison feels comfortable with the use of computers and information technologies. She is willing to try out new applications and technologies and to experiment. She believes this sort of confidence encourages her students to explore. She cites one student with learning difficulties who is using a word processing package and who can memorise icons and use a spell checker to great advantage. She is impressed with how quickly the child has picked this up and how much is remembered. Even so, she believes that "more formalised" reading skills are required for the Internet and CD-ROMs where information is usually presented for an adult audience.

A distinguishing feature of Alison's classroom is the way learning is scaffolded for students. Every unit of work is clearly outlined so that students know where each lesson fitted into the whole. Students are aware of the outcomes they were working towards and the skills to be developed, as well as strategies to be used in individual lessons and what homework was expected. In addition, Alison constantly checks that students understand details such as the meaning of words and phrases. She expertly builds on student knowledge by eliciting what they already know and with them deciding what they need to find out in order to complete assigned work. The

purposeful use of computer technology is a part of most unit plans. These units or work are well documented for easy sharing with colleagues.

The study raises many issues about the place of computer and information technology in student learning, about equity of access to computer technology and about the difficulties associated with attempting to map new technologies onto old organisational structures. The school has reached a juncture and is taking stock, moving forward slowly through open debate and the establishment of agreed goals for student learning.

*Spur Primary School: Melding the old with the new*

Spur Primary is a large school set in a rich agricultural region of NSW drawing its students from the local farming population. The community acknowledges that life is changing—the Internet for example is becoming the primary source of information on the weather—and that their children will need different skills and knowledge. The school has a strong emphasis on literacy. There has also been a consistent emphasis on the use of technology which means that teachers and students have had access to hardware and software for some considerable time.

The study focuses on five teachers and the principal and their views on computer and information technology and the future. They share a concern to equip their students with the skills they will need when they either move away from home for jobs in the city or else find jobs at home in an increasingly technologised landscape. They see the current technology policy as enabling for their own professional development.

Some teachers spoke of the widening gap between generations and of the implications this may have for future teachers, that some students are more computer literate than their teachers, depending quite often on whether or not there is a computer in the home. Observations of children working in the computer room during this study would indicate that computer usage at Spur Primary has a very strong and important social dimension (Durrant & Hargreaves, 1995, 1996; Snyder, 1993b).

In terms of the development of new literacies, these teachers are conscious of the life skills that they must impart to their students. Such skills as numeracy, form filling, technological literacy, and visual. There was a concern that students critically study the mass media so that they would be able to interpret and not be manipulated by texts.

This site study highlights the need to overcome the lack of a formal framework for skilling staff. It also shows the need for the school to work more closely with the local community to gain parental support for the school technology program. Thirdly, it brought up implications that schools need to shift the emphasis from word processing to more creative and explorative uses of the technology.

## *Principles, Issues and Implications*

The case studies identify important, noteworthy and interesting practices and policies found in Australian schools and classrooms. Even a cursory reading of the reports from each of the sites reveals patterns that are difficult to ignore. When considered in conjunction with the patterns reported in schools a decade earlier in an account of the national evaluation of the commonwealth computer education program (Bigum et al, 1987), certain trends become apparent.

The reported phenomena and the deduced trends and patterns can at least in part be associated with the structures, practices and policies of schooling, of school systems, of telecommunications, of the new technologies and the broad sociotechnical circumstances in which these events are found. Two points stand out here. The first is the role of schools as a "defining" or even "determining" technology influencing the ways other technologies (in this case, *new* technologies) get taken up (Hodas, 1996). Second, the relationships between the new communication and information technologies and language and literacy education across the curriculum bear critical examination.

*Patterns and Principles*

The issues and implications emerging from the analysis of the site studies provide a linchpin for how we make sense of them, especially in regards to effecting change in practice and school reform. We have identified three broad patterns and four principles (to be described shortly) which have enabled us to draw together the practices and theories we have encountered in the site studies. Taken together, they serve three analytic purposes:

1. organising—they provide an organising framework for the issues arising from the empirical studies undertaken at the thirteen sites. They help us make sense of the data;

2. normative—the patterns and principles are useful for making decisions about the good and bad points of upholding them in specific situations. They act as sets of values in assessing what is possible to achieve in future directions of practice;

3. practical—they provide a pragmatic mechanism for formulating concrete recommendations for future actions. They are sign posts pointing to future actions to improve practice.

## *Three Broad Patterns*

*Complexity*

Classrooms, like other social systems can be described as complex by pointing to the large number of inter-relationships that operate both inside and beyond the walls of

the classroom. We draw on the ideas and metaphors from the new science of complexity to more thoroughly examine. In our view complexity is an overarching frame which usefully locates the work of teachers, students and the new information technologies in a way that highlights the emergent, fragile and mutually constitutive nature of practice in the classrooms we observed.

Describing classrooms as complex systems underlines their self-organising character, the mutual dependencies that each component of the classroom, human and non-human, shares with other components. Adding technologies to classrooms adds to the number of components which participate in the mutual constitution of roles, thereby shifting existing patterns of self-organisation in unpredictable ways.

A complex system is also understood as being on the "edge of chaos": that is, in a state that is neither ordered nor chaotic, a state in which the components of a system never quite lock into place but which also never slip into chaotic behaviour. The movement of classroom arrangements that move between what an outsider might regard as ordered and disordered is familiar enough to most teachers.

More interestingly, from a complexity point of view, aiming to distribute technological practices evenly across the curriculum (a kind of equilibirum model) can be seen to be inherently difficult. Complexity theory suggests that "increasing returns" will concentrate technologies in particular sites: that is, the more a particular curriculum area employs computers, the more likely it is that it will make more use of them. We should expect to see concentrations of technologies, not even distributions of them.

*Fragility*

The fragility that was observed in our site studies is characteristic of the mutually constitutive nature of classrooms. A self-organising system is one that depends upon the successful allocation of roles between all of the components in a classroom. When a component is unable to play its role, be it a teacher, a modem, a computer, the behaviour of the classroom is typically unable to reorganise in a way that enables a continuance of computer use in the curriculum. Clearly, classrooms are more sensitive to the loss of particular components, an expert teacher, a piece of hardware or a telephone connection.

*Continuity*

We observed significant discontinuities in student learning with CITs (e.g., students do multimedia projects mediated by the computer in Year 4, but hardly ever turn a computer on in Year 5 because the teacher is unfamiliar with CITs). Discontinuities arise because of the uneven concentration of CIT resources, both material and human between and within schools. Framing classrooms as complex systems leads us to expect sharp differences in the distribution of CITs. Without continuity, there is no guarantee of developing a portfolio of student learning outcomes. Continuity is critical to realising the desired scope and sequence of curriculum upon which student learning is based, and from which students develop proficiency in all three dimensions (operational, cultural critical).

## *Four Principles*

In circumstances in which teachers, students and CITs are seen as comprising complex assemblages, also known as classrooms, conventional educational principles seem inappropriate in coping with the other patterns we have reported, fragility of practices with CITs, and problems of continuity. We offer four principles which provide a coherent approach to coming to terms with what is clearly difficult curriculum work, making use of new CITs in language and literacy education and in other curriculum areas.

*Teachers first*

This principle affirms the importance of attending adequately to the professional needs of teachers in learning the new CITs, and their relationship to language and literacy education concerns across the curriculum, *even before* the needs of students. This principle means supporting teachers in making use of CITs to support their personal work, before they begin to use it in their teaching. It is based on the premise that for teachers to make sound educational choices about deploying CITs in their classroom practice requires that they use it for their own purposes first. This principle directly addresses the patterns of fragility and continuity reported in the site studies.

*Complementarity*

This principle emphasises the importance of understanding the adoption of a particular technology in as broad a context as possible, especially in relation to language and literacy concerns across the curriculum. For example, for each technology tool employed, it is critical to ensure that skills complimenting its use are also taught. Take the case of a hand-held calculator. In order to use this technology a student requires at least two complementary skills: an ability to approximate or estimate an answer, and a knowledge of significant figures. Likewise, use of the Internet as an information gathering tool will require yet-to-be-identified complementary skills for its successful use. In the use of any software, it is critically important to identify the complementary skills a user ought to have in order to make sensible use of the software. This means knowing about the limits, assumptions and approximations built into the software. This principle directly addresses the complex nature of the use of the new CITs in classrooms. Thoughtless use of software is equivalent to blindly assigning roles to software that either don't exist or are incorrect.

The principle works at many levels. In countries like Australia or the USA where many homes have computers for student use there is a consideration of complementarity between school and home. In this vein, schools might offer access to specialised computer resources that may not be available in the home. An important aspect of complementarity between home and school is consideration of students from less advantaged homes with no computers.

*Workability*

This principle deals with the crucial test for implementation of any new technology—does it improve the teaching and learning cycle? Considering workability in the introduction of new CITs includes factors such as the cost of teachers' time in learning how to use it and in the redesign of curriculum. The principle requires that the use of any hardware or software improves, helps, or supports the work of teachers or students. It affirms that the work of teachers and students is a priority in determining whether or not to adopt or implement a particular technology. Because we are dealing with complex systems, this is difficult to determine in advance. Hence, any adoption of new technology requires a principled approach that acknowledges the actual costs associated with taking on a new technology.

*Equity*

This principle affirms the importance of equitable access to computing resources and access to information that enables teachers and students to make informed decisions about their use of computer technology. The use of CITs in schools always involves choices about resource allocation, often made more difficult because of the concentration of new CITs in particular curriculum areas. Often this is driven by prior access to information about current technology resources, in order to upgrade and re-equip the school (the principle of increasing returns). Thus, schools that are technologically poor in resources tend to get less, while those with some get more. The equity principle recognises this tendency and attempts to rethink the allocation issue in order to even out unfair distribution across different school sites. This is not merely a matter of putting equipment in place. Understanding these systems as complex and susceptible to aggregations driven by the principle of increasing returns, it draws attention to the importance of building up sufficient knowledge in impoverished sites to attract material resources by "natural" means: that is, by making knowledge-poor sites less so.

## *Issues and implications associated with patterns*

What follows is an account of phenomena at the different sites as a basis for mapping the current terrain around literacies, learning and the new technologies in terms of the three patterns and four principles. Particular issues and implications are discussed under the heading of each.

### *Complexity*

It is not surprising that across the site studies different teachers employed a variety of classroom management strategies in attempts to deal with the complexity they faced in their classrooms. Seen as a process in which all the components of a classroom negotiate their roles with all other components and that the teacher is but one of a number of agents or actants who contribute to a self-organised outcome, complexity is less something to combat and more like something to live with. This is not a trivial consideration as it affects the social arrangements through which students engage in

learning the curriculum. Thus, teachers' perceptions about allowable levels of student movement around the classroom, arrangements of furniture, and levels of noise from student discourse and use of materials, have implications for what kinds of activities and social learning groups he or she will try and establish. How successful a teacher is depends in large part on their capacities to negotiate with technologies that are much less compliant than students, and students who often are more skilled than teachers at assigning roles to the new CITs.

Complexity in the way we are using it is a good deal more than just a matter of additional factors to deal with in a classroom. It draws attention to the importance of negotiations that need to occur in order for self-organisation to take place, for the classroom to operate. It points to the local concentrations of particular technologised or literacy practices in classrooms (thems that has gets).

In terms of language and literacy issues, classroom discourse communities also need examination. For instance, teachers in a school such as New Park (with 90% of students from non-English speaking homes), would have to consider the multicultural and multilingual diversity in their students. This would have implications on both the classroom discourse norms set in place as well as curriculum decisions. These teachers have to deal with a diversity of students whose negotiations with one another, teacher and any technology would not be easily anticipated.

As a means of describing classrooms, whether technologised or not, "complexity" gives the classroom teacher useful ways to think about many of the classical problems of working in a classroom. Instead of seeing new technological developments for the classroom as "add-ons", they become active things in the classroom, just as capable of forming powerful liaisons with students as with the teacher. Internet access for instance brings into the classroom a new set of agents (remote computers, students and teachers in other classrooms in other parts of the world) who will negotiate their roles and the roles of others in the classroom. In this sense, complexity is not seen as a problem but as a means of characterising the large number of inter-relationships that shape classroom practices.

One macro-sociological aspect involves a teacher belief that the Internet is part of an overall globalisation of education. This is apparent in site studies that involved students in doing assignments in which overseas schools were an integral part of local school projects. Whereas in the past international projects were adapted to local conditions, now local schools can be joint partners in projects with overseas counterparts. State and national boundaries become irrelevant. This requires a different approach to preparing preservice teachers who will need to see themselves as part of an international community of educators, in a far more demonstrable way than print technology and many, if not most, teacher education programs have allowed to date. From the site studies, it is apparent also that teachers will need to be aware of the range of resources and opportunities available in the community and processes for accessing them in a school context. Information technology will blur the boundaries between school and home and, indeed, between school and community (see Doneman, Volume Three).

### *Fragility*

Among the many possible issues which derive from the complexity of classrooms and might be taken up, that of recognising the problems of fragility needs primary consideration. Across nearly all of the site studies, several of the CIT initiatives depended strongly on one or a few individuals. Enthusiasm and teacher-initiated learning are certainly essential, as is expert technological support to successfully implement new technologies into school practice—the absence of enthusiastic, knowledgeable teachers has prevented successful, or even initial, uptake of new technologies into the curriculum (e.g., many of the BushNet schools that did not take up the opportunities of the three schools featured in the site study). In some cases this means developing a do-it-yourself expertise (for instance, in one of the successful BushNet schools, a deputy principal became a technical trouble shooter).

Many of the site studies focus on issues and implications arising from the technical aspect of fragility. There are difficulties experienced in accessing the Internet and in getting the technical support necessary to keep things running satisfactorily. Often, the local telephone lines are incapable of carrying the volume of traffic for the area, resulting in ready access at only certain hours of the day, and *not necessarily* during school hours. These difficulties result in the limited range of current uses of the technology.

There is a tendency in many cases, to view the school principal or technology coordinator as the person in charge of purchasing and upgrading of hardware and software. As with any system, a computer technology system needs constant attention at the technical/maintenance/upgrade levels, and without someone acting in these capacities, there is potential for the system to be somewhat fragile. Somebody with the interest, expertise, and experience needs to take up the position, and often this was a person in a school managerial role.

In a few cases, there have been school policies implemented to overcome fragility (e.g., New Park and Ealing Grammar). Such schools are interested in ensuring that technology is not person-dependent: that it becomes a cross-curriculum initiative involving all members of staff. There remains one concern in the area of fragility—some schools can instigate reforms knowing that they continue to fund them, while the others have extremely limited resources and, therefore, far fewer options (Secada, 1989).

### *Continuity*

Continuity is especially important to consider when a school makes decisions about its curriculum policies. The case studies document good examples of students benefiting from the fact that the school's technology policy is coherent, comprehensive, and integrated with other policies—notably its language policy. This is at both a grade to grade transition as well as lower to middle to upper primary shifts, and reflects the increasing returns that are associated with a particular curriculum area when it develops the basis for adopting CITs. In the strongest cases, both teachers and administrators express a general concern for students moving within the school from

year to year. They put policies in place that ensure a strong commitment to continuity in the computer technology curriculum. Continuity within the school is less of a problem when most teachers in the school use computer technology in the classroom (e.g., Carlisle). Nevertheless, in the context of understanding classrooms and schools as complex systems, local concentrations of expertise and equipment are to be expected and achieving more even distributions is not a simple task.

Many of the site study teachers feel that continuity is a big concern, especially for word processing skills which they believe will be increasingly important to their students. Their understandings are informed by familiar patterns of distributing other materials and resources across curriculum areas or grades. High technology has proven to be unlike such resources and appears to concentrate rather than spread evenly. Teachers are clear about the skills they believe ought to carry between grades. These include editing, the use of icons, cutting and pasting, as well as typing. In addition, skillful use of new technologies can enhance presentation of student work. Not surprisingly, publishing and formatting texts is a strong classroom focus. Furthermore, traditional ways of teaching and learning about spelling and grammar can be supplemented with appropriate use of spell and grammar checking features of word processing programs. None of these skills, however, can be taught to mastery without *continuity* operating in curriculum planning across school levels.

Movement from primary to secondary school is also considered to be a potential problem in continuity of student learning. Student access to computers in first year of high school is often restricted to the occasional visit to the computer lab (Cairney, Lowe & Sproats, 1994), whereas those same students in the final year of primary school may have had access to a computer all day and made choices about appropriate use. Restricted availability of computers influences the way in which they are used. Whereas in the primary school classrooms observed students often had control over when computers were used, for what purpose, with whom and for how long, students in some high schools often have far less autonomy. Those with computers at home can continue learning in a play (cf. *acquisition*) environment: making decisions about all the important bits (with whom? for how long? what? how?); experimenting; exploring; immersing themselves in the environment; learning the language and culture of the space; as well as learning the skills necessary to participate. It is interesting to compare the home and school as two self-organising systems and enquire about the roles of the various actants in both settings. The learnings that occur in the two settings are likely to be markedly different. Those with access only at school may well learn that computers are for something else—e.g., final copy of the report, or the constructing of a database in history: that is, for *school* tasks, an intellectual exercise with little relevance to the outside world.

### *Issues and Implications associated with principles*

Framing classrooms as sites of complexity and recognising the self-constituting role played by all the actants in a classroom help with identifying possible, principled interventions.

*Teachers first*

The principle here is "teachers before kids". If teachers are supported and encouraged to use the new information technologies for their personal interests and professional work, they will be better placed to translate their experience ofCITs into appropriate pedagogical applications in their teaching. We found good practice was characterised by a reflective process in which teachers subjected their pedagogy to theoretically informed scrutiny (e.g., Abbotsdale). Teachers benefit from a grounded familiarity with computer technologies. For some teachers, long years of working with computers, with lots of space for experimentation along the way, have brought the kind of fluent mastery of performance that Gee (1996) associates with the mode of acquisition, as opposed to learning. As with becoming a fluent performer in any social practice—as indeed with fluent and proficient language and literacy performances themselves—there is no real substitute for extended immersion in mature forms of social practices (Gee, Hull & Lankshear, 1996), in which new technologies are organically embedded and deployed. Another aspect of the teachers first principle evident in the site studies relates to teachers living out their theoretical foundationsin their larger professional life. They participate in communities of practice beyond their immediate workplace, being active members of, say, computing clubs or listservs. Through such larger life experiences, teachers undergo continuous professional development which is fundamental to supporting the teachers first principle.

Teachers with such expertise come to classrooms with well-honed capacities to better "negotiate" with the new CITs, and so influence the organisation of computerised classrooms to meet a variety of educational goals.

There is a growing awareness of the need to increase access to departmental staff development funding to broaden opportunities in applications of new technologies to education. It is evident that many teachers would benefit from computer workshops to support the school's teaching and learning program. In addition, there is a need for increased access to computers and more allocation of time for preparation and exploration of software and hardware resources. In some cases the teachers first principle was enacted as a distinctive school practice, giving full recognition to the importance of technical support within classes and in-house professional development programs. The most important feature is that teachers have the opportunity to "rehearse" a technology project at least one term before it actually runs. Not implementing the teachers first principle and impedes smooth implementation of new technologies into the school curriculum, and encourages greater dependence on just a few enthusiasts, leaving the school technology practice vulnerable to fragility.

It is clear across all the site studies, that the support of enthusiastic administrators is critical to recognising the strengths of the teachers first principle. Even in cases in which technology projects were introduced by enthusiastic teachers, they were still strongly supported by their school administrators (e.g., BushNet).

One final issue related to supporting the teachers first principle concerns school staff development and curricular priorities. The primary concern is that devoting time to the upgrading of skills and knowledge in the area of computer hardware and software

means decreased time available for other initiatives. This, in turn, raises issues about what's valued in the overall school mission.

*Complementarity*

Issues and implications resulting from school practices that take the complementarity principle into account in their planning and policies are evident in all site studies. The awareness that complementarity skills need to be considered is apparent as teachers talk of the pressure imposed on them in terms of acquiring new skills and having to teach students new skills. There is a strong sense that they simply cannot ignore the social and cultural demands to familiarise students with these technologies. They understand that it is the school's responsibility to prepare students for the world beyond school, and that technology is central to that world (e.g., preparing students to work in a nonlinear environment, to learn how to skim, to work in a layered way—layers of thinking—being able to evaluate critically, reading the visual, selecting valuable resources from the Web). There is a widespread feeling that the literacy skills demanded in using the new technologies represent newliteracies that students need for coping in a changing world.

Another aspect of complementarity is that teachers feel they have a responsibility to take the community on the same learning journey as they are implementing at the school in terms of technology education. They believe that education should be leading the community in this area rather than being pressured by the community, often via the media, into specific aspects of technology uses in schools which may or may not be grounded in education theory. In one teacher's words, "We need to do a great deal of awareness raising with the community and staff to increase the valuing of technology in literacy learning."

As observed in most of the site studies, new technologies are often employed to gather information for specific classroom assignments and projects. This highlights the importance of complementarity with respect to explicit engagement of the cultural dimension of computer-mediated literacy practices, and with a view to developing skills for assessing or evaluating as well as gathering information. In most of the site studies students did not engage in exploring the cultural meanings of computer-mediated literacy practices. Nor did these activities emphasise the importance of students adopting critical stances toward information or, more generally, toward the uses of new technologies within everyday social practices. Lack of explicit learning objectives for these critical thinking skills have important implications for school-to-workplace transitions. Teachers are beginning to see that technology of the future classrooms need to include a greater emphasis on video editing, animation, graphics and an increased use of the Internet. Global objectives include the ability to skills from one medium to another, problem solving strategies, collaborative work, and an emphasis on divergent thinking.

*Workability*

How new technology can improve teaching and learning—that is, their *workability*—is a major concern across all site studies that has important implications for school practices and policies. It is evident that teachers need access to, and a voice in, the

debate on the nature, implications and critique of new technologies. While some teachers talk about new technologies as simply one more tool that can be used to promote learning and problem solving, it is clear that others see them as springboards for new and different ways of teaching traditional reading and writing skills and, in turn, promoting different ways of investigating new sources of information and creating new and different text forms (see Snyder, 1994).

Whenever technology is used outside of subject Technology, there is an apparent tension in the degree to which teachers are teaching the technology, perhaps at the expense of the limited time allocated for their particular subject. A premise intrinsic to the theoretical underpinnings of this project is that there are complex interconnections and interdependencies between technology and literacy (Peters &Lankshear, 1996). Knowing how to use the technology is part of being multi-literate. However, it still takes time to learn how to use multimedia technologies, and then to integrate them into particular classroom activities and purposes. Teachers see this as a problem. This is a prevalent feeling, even in cases where teachers are satisfied with the level of resources and professional development opportunities (e.g., Abbotsdale or Ealing Grammar).

The site studies support observations by other researchers that English teachers are sometimes among the most resistant to using the new technologies (e.g., BushNet, Ealing Grammar). For example, with multimedia, some feel the text is all important and that students waste too much time with visual information. They still regard the visual as secondary to subject English. There is a tendency to protect what is traditionally regarded as the territory of English—the book and the spoken word. Yet, in the site studies, many students remarked that being able to express yourself in three dimensions is powerful and desirable (i.e., in multimedia assignments). Equally, many other teachers in our site studies claim that the use of new technologies adds a level of engagement and interest in the class that is not always present otherwise, which contributes to effective learning and teaching.

In a few of the site studies, *workability* is considered a priority in deciding whether or not to adopt and implement a given technology tool (e.g., Abbotsdale, Ealing Grammar, Carlisle). In this respect, expenditure on hardware and software can be considered a minor part of the cost equation. The real costs of effective use are associated with teachers' time in learning how to operate the technologies and, then, in acquiring the knowledge and understanding required to design and implement classroom learning activities which integrate the technologies in sound pedagogical ways. This includes providing genuine opportunities for students to acquire relevant cultural and critical understandings, *as well as* operational knowledge. It also requires that schools ask tough questions. For instance, schools need to decide at what points the benefits of offering students opportunities to work with new technology applications become outweighed by the risks of apprenticing them to inferior versions of social practices.

*Equity*

The importance of addressing the *equity* principle is evident from what was observed in the site studies. It was quite common to find students assuming powerful roles as experts who could assist and guide their peers and teachers in using the new technologies. That some learners have greater physical access to tools than others inescapably sets up conditions for unequal opportunities and outcomes—especially when the tools in question are part and parcel of esteemed and rewarded social performances. As formal education becomes increasingly devolved to local levels, it becomes absolutely essential to establish guarantees that limit physical access differentials as far as possible (Knobel & Lankshear, 1997).

At the same time, technical proficiency alone accounts for only a proportion of the variation between the ways educators mobilise new technologies within language and literacy education. Even if technical training were held constant, literacy practices and activities drawing on these technical proficiencies would vary greatly. We have known this for a long time in relation to other learning technologies but have failed to build the insight into inclusive and democratic educational practices. If anything, the current technicist fetish evident in language and literacy policy emphases is taking us in the opposite direction. Many current approaches to remediation, diagnosis, assessment, and reporting privilege code breaking and limited aspects of text participation over other essential dimensions of becoming successful readers (cf. Freebody, 1992). This creates contexts in which different cultural capitals and funds of knowledge can play out in ways that intensify unequal opportunities for access to social goods (Gee, 1996). Under such conditions, current demands for more professional development and inservicing are often under-informed, and betray a magical consciousness (Freire, 1972) of the powers of training packages.

This does not mean holding back on demands for improved professional development opportunities and inservice teacher education. Rather, we need to make better informed demands, and to meet these demands with better informed responses. This involves widening our focus on the issues surrounding the role and place of new technologies within education generally, and literacy education specifically. Efforts to better prepare ourselves for integrating new technologies into successful and inclusive language and literacy education must be informed by research and experiences which identify and explain different "ways with words and Windows" (Knobel & Lankshear, 1997), and the different social, economic, and cultural rewards and statuses associated with them.

We found cases where concerted efforts were made to educate everyone fairly in terms of access to learning new technologies. In the Carlisle study, for example, the teacher developed a well structured timetable to ensure equity of access to resources such as the computer. The result of this was that despite the poor computer to students ratio, students saw themselves as having constant access to computers (cf. also Facing the challenge). Computers were part of their classroom lives and there was no trace of anxiety over getting a turn. A card system meant that individual students knew they would not be overlooked when it came to their turn at the computer.

The site studies raised the issue of caution for teachers to be aware of the blurring of boundaries between school and home information technology access. While such blurring can be exploited by the education community, we need to be aware of the issues of *equity* and access in a context where the gap between information rich and poor is widening. It is important to ensure that students who do not have access to information technology at home are given adequate access at school, and that opportunities are available out of class time. These students may also need access to instruction that other students who are familiar with the medium may not need. Greater consideration given to timetabling of facilities may assist in ensuring equitable access.

These site studies provide rich data for developing viable notions of access and equity in relation to new technology-mediated educational opportunities. Access is about much more than the physical availability of infrastructure alone (Burbules, see Volume 3 of this report; Knobel & Lankshear, 1997). To have access on equitable terms to social practices mediated by new technologies has a lot to do with communities of learners being initiated into activities in the presence of genuine familiarity and expertise. Fluent performance can be acquired through immersion in practices with supportive guidance, structuring, explaining, and modeling by masterly performers.

## *Conclusions*

In conclusion, findings from the site studies identify a range of issues and implications about technology and literacy education concerns. The patterns and principles elucidated above provide a helpful framework for understanding educational concerns across a number of specific school situations, as well as for making sense of how school practices are constrained or enabled in terms of attaining desired student learning outcomes. Specifically, these studies can inform all stakeholders in education in at least three domains: inservice teacher professional development; preservice teacher education; and theoretical guidance to change in practice and school reform.

First, in the inservice teacher professional development domain, the enthusiasm of colleagues, on the spot, is crucial to integrating technologies successfully into the curriculum. Of course, while the concept of “enthusiasm builders” makes sense, and certainly fits in with findings across the studies, it alone cannot guarantee quick, sure, uniform results. Also, reliance on a few individuals can lead to the fragility of any endeavour. It is no easy task to change the culture of a school, and little short of this is required if teachers are to help their students develop a fullytechnologised literacy. Teachers themselves can identify ways of learning that work best for them and the kinds of support they most need. That might mean reconceiving their roles within the school, local and global community as mutually informative learners. These ways and means need, perhaps, most of all to be underpinned by teachers’ own convictions about the entitlement of their students to comprehensive literacies for a technologically saturated future. Telling cases, such as we have tried to provide in the site studies, can work very powerfully on teachers’ imaginations. So it can be when teachers try something out, share their experiments with others, and talk about it with

interested peers. By such means new practices are developed, and over time an ethos—a culture—can be built.

Second, in the domain of teacher education it is clear that keyboarding skills and basic familiarity with information technologies and their educational applications must become a compulsory feature of future preservice programs, if the next generation of teachers is to successfully engage students in using new technologies. This may well lead to reconceptualising both the teacher's role in the classroom and the kinds and uses of technologies which best support learner focused rather than teachercentred environments. It is arguable that the teachers who are currently doing the most with new technologies are those who have recently graduated. If true, however, this is by no means necessarily because they received adequate training in their undergraduate programs. Often, it is because they learned how to word process at university in order to prepare their own assignments. More needs to be done at the university level to ensure that no education graduates enter teaching without a working expertise in using new technologies and, more critically, without knowing how to integrate them productively into their teaching approaches.

Finally, in the domain of theoretical guidance to pedagogical change and school reform, the patterns and principles we have developed are helpful in considering both the critical and cultural dimensions of literacy. In most of the sites investigated, the lack of attention to the cultural and critical dimensions undoubtedly had a lot to do with the fact that students and teachers alike were closely involved in learning new operations. At the same time, however, it is important for realising syllabus objectives that the critical and cultural dimensions of literacy be addressed as far as possible in conjunction with operational learning. This is always likely to be more of a challenge under conditions where access to equipment and operational knowledge and prior experience are scarce than it will be under more abundant circumstances. The fact that relatively little critical emphasis was evident during any of the sessions observed across the entire project may indicate the extent to which classroom practices involving new technologies are being exhausted on getting to grips with the operational dimension. This is understandable in many of the cases observed, given the relatively limited prior experience many teachers have had with communications and information technologies. It does, however, reinforce the importance of attending to all patterns and principles (*teachers first, workability, equity, continuity, complexity, fragility, and complementarity*) within future policy directions and professional development and teacher education initiatives.

# Chapter Four

# THE AUSTRALIAN POLICY ENVIRONMENT: DESCRIPTION AND ANALYSIS

This chapter is presented in four sections. The introduction deals briefly with the nature and role of policy. The second section examines a selection of key national policies concerned with literacy, technology and the broader sociocultural context. The third section analyses key policies from three Australian states: NSW, Queensland and Victoria. The fourth section outlines the key themes and major findings.

The policy documents were analysed in terms of what they say about English and literacy, Technology and computing, and learning. Analysis and commentary were undertaken with a view to developing recommendations for future policy development, drawing on concepts, theories, research evidence, and values which are addressed and developed in the larger work of the project.

## *Introduction*

How is policy to be understood? What is policy? What is it for? The conventional or commonsense view is that policy constitutes an informed statement of principles and recommendations that are intended to shape and guide practice, and even to direct or instruct it. That is, policy is in a determinative or causal relationship with practice. This is the view of policy as, and in terms of, *instrumental rationality.* Kliebard (1992, p. 183) describes policy in this way: "We deem policies of all sorts . . . as good or bad, if not in terms of their announced purpose, at least in terms of their demonstrable consequences". Moreover: "The first indication of success comes when and if the policy is translated into a concrete plan of action and the second when the policy is weighed in terms of the extent to which it actually succeeded in accomplishing the stated purposes".

Such a view is consistent with a common understanding of the relationship between “theory” and “practice”. Policy is thereby aligned with theory, and serves similarly to inform and structure practice; the theory-practice relationship is hierarchically structured, as is the policy-practice relationship, although both contradictorily so. The contradiction proceeds, in both instances, from the fundamental ambivalence with which practice is regarded: at once a secondary concern, and a matter simply of application, *and* a primary consideration, the very *raison d'etre* of theory and policy alike. In such a view, theory (and research) is allied with and directly informs policy, and theorists, researchers and policy-makers represent particular forms of expertise and authority *vis-a-vis* teachers and schooling. Policy is therefore the pragmatic wing, as it were, of the pursuit and production of “truth” and knowledge, specifically in the

service of control. In this view, policy is to be understood as a necessary context for practice.

It needs also to be observed that such a view is linked to a “container” view of context and very often to a “conduit” view of language. That is, policy “contains” practice, and information simply flows from the site(s) of policy to those of practice, hence shaping *and* constraining action.

In contrast to the view of policy as instrumental rationality, it can be understood as *symbolic action*. According to Kliebard (1992, p. 184): "[Symbolic action] is primarily a way of shaping public consciousness and gives meaning and direction to an entire sphere of social relations and social institutions". Hence: "[It] is centrally concerned with the symbols that give meaning and order to our world, including social relations, and thereby shapes our beliefs and prompts us to behave in certain ways". He goes on to suggest that "[r]ather than serving to accomplish a defined purpose, the main function of symbolic action resides in its use of language to organise allegiances, perceptions and attitudes" (Kliebard, 1992, p. 185).

Thus policy is usefully understood as having *both* a pragmatic aspect and a symbolic aspect. It is concerned, on the one hand, with more or less direct, material action on the world, and on the other, with influencing how that world is understood and experienced. This means that attention needs to be addressed not simply to what might be called official or formal policy—for instance, the actual policy documents and mandates of governments—but to unofficial or informal forms and instances of policy—discussion papers, for example, which may never be legislated or approved but which nonetheless exist in some form or another in the public domain. It becomes important, therefore, to give consideration here not simply to official and authorised policy documentation but to that which is no longer, strictly speaking, current. This is because it seems necessary to take account of *the policy climate* as a whole, as much as of individual documents and decisions. That is, we are influenced as much as anything by what's “in the air”—whether carried in popular media debates or current opinion, talked about at dinner parties, academic speculation, or simply a matter of seemingly casual conversation. This is sometimes understood in terms of the contexts of influence and formulation.

An important distinction here is between policy as *text* and policy as *discourse*. Ball (1993, p. 10) speaks of policy as "a toolbox of diverse concepts and theories". In making this distinction, he draws on poststructuralist frameworks and understandings, and proposes three contexts of policy making: "the context of influence, the context of policy text production, and the context(s) of practice" (Ball, 1993, p. 16). These are “loosely coupled” and often multiple, and constitute dynamic fields or arenas of action, such that "there is no simple one direction of flow of information between them". Rather than a one-way, top-down movement from “policy” to “practice”, as outlined previously, policy and practice are mutually conditioning and directly interrelated, with the various take-ups of “policy” in “practice” feeding back into the maintenance, renewal and transformation of “policy”, and forward once again into “practice”. In such a view, policy is as much a form of practice as practice is a form of policy—and, most importantly, teachers and other school personnel are directly implicated and engaged

in the making and re-making of policy. This may be in the form of actual school-level policy or even subject-department or indeed classroom policy work. Policy is not just something that is done by "them" for (and to) "us" to simply enact or implement; rather, it is part of everyday educational work, at whatever level, and this remains the case at all times and in every instance. That there is a tendency for school-level practitioners to view themselves as simply the object of policy is a profoundly ideological matter.

It follows that becoming informed about the policy process is an important part of educational agency. This includes understanding policy as the authoritative allocation of resources and values, but also that this is something that is never unproblematic or uncontested. Rather, it means understanding that in fact both the authority in question here and the nature of the allocation are inherentlyconflictual, and a matter always of struggle, negotiation and compromise. In Ball's (1993, p. 11) eloquent terms: "A policy is both contested and changing, always in a state of '"becoming', of 'was' and 'never was' and 'not quite' [. . .]". Recognising and acknowledging the forms and effects of power at play in the policy process is therefore an absolutely crucial move. Further, it means grasping the notion that policy has a significant "impression management" function. Increasingly, in a complex and volatile political environment, it is not so much that things need to be done but that they need to be seen to be done: a matter, that is, of *image*. This can be described as a simulacrum effect, whereby what is put into circulation is "image" and what matters primarily is the generation and circulation of images. This is not necessarily to be understood cynically. The sheer rate of change and the complexity and volatility of information in what has been described as postmodern economic and cultural conditions make it difficult if not impossible to fix upon clearly defined, stable fields of action, other than in the realms of signification and representation.

At the same time, it would be unwise to dismiss altogether the "steering" function of policy—the notion that although policy does not and indeed cannot determine educational practice nonetheless it may be seen as informing and guiding it, and as providing what might well be governing images and as suggesting programs of action and calculation. Hence, *both* the pragmatic and the symbolic dimensions of policy must be attended to, in any adequate assessment of, in this case, literacy, information technology, and educational policy and practice.

A final point. It also follows that policy should not be seen as exclusively the province of governments or systems. Rather, schools themselves need to be seen as equally makers of policy, not simply in the informal sense outlined above but also in the more formal sense of official and/or working documents or "texts". Indeed it may well be that particular classrooms need to be actively seen as sites of such policy making. In this way, it is possible to see policy operating at a number of different levels, each in dialogue and negotiation with each and all of the others but maintaining nonetheless a certain irreducible difference. Such a view allows for due consideration of *both* constraint and agency, and hence of movement within limits. It also means, importantly, that schools and school personnel are positioned differently in relation to the policy process as a whole, with a possibility of mediating between macro and micro aspects of educational practice. In Corson's (1990) terms: "Policies mediate between a school's 'charter' or 'philosophy' and what really happens in a school;

policies say 'how we will do what we hope to do'". In order to do this, of course, a school needs to draw on informed understandings of the policy context at large. What follows seeks to provide an account of that context, with specific regard to the role and significance of literacies and technologies in Australian education.

### *National Policies*

In this section, the following policy statements are examined:

1. Department of Employment Education and Training (DEET), (1991a). Australia's Language: The Australian Language and Literacy Policy. Canberra: Australian Government Publishing Service.

2. Department of Employment Education and Training (DEET), (1991b). Australia's Language: The Australian Language and Literacy Policy, Companion Volume to the Policy Paper. Canberra: Australian Government Publishing Service.

3. Parliament of Commonwealth of Australia, (1992). The literacy challenge: A report on strategies for early intervention for literacy and learning for Australian children. House of Representatives Standing Committee on Employment, Education and Training. Canberra: Australian Government Publishing Service.

4. Curriculum Corporation, (1994a). A Statement on English for Australian Schools. Carlton: Curriculum Corporation.

5. Curriculum Corporation, (1994b). English—A Curriculum Profile for Australian Schools. Carlton: Curriculum Corporation.

6. Curriculum Corporation, (1994c). A Statement on Technology for Australian Schools. Carlton: Curriculum Corporation.

7. Curriculum Corporation, (1994d). Technology—A Curriculum Profile for Australian Schools. Carlton: Curriculum Corporation.

8. National Board of Employment, Education and Training (NBEET), Australian Language and Literacy Council (1995a). Teacher Education in English Language and Literacy. Canberra: Australian Government Publishing Service.

9. Parliament of Commonwealth of Australia, (1991). Australia as an Information Society: Grasping New Paradigms. Report of the House of Representatives Standing Committee for Long Term Strategies. Canberra: Australian Government Publishing Service.

10. Commonwealth of Australia, (1994). Creative Nation: Commonwealth Cultural Policy. Canberra: National Capital Printing.

11. Tinkler, D., Lepani, B., & Mitchell, J., (1996). Education and Technology Convergence: A survey of technological infrastructure in education and the

professional development and support of educators and trainers in information and communication technologies. Commissioned Report No. 43. Canberra: Australian Government Publishing Service.

***The analysis***

1. Department of Employment Education and Training (DEET), (1991a). *Australia's Language: The Australian Language and Literacy Policy* Canberra: Australian Government Publishing Service.

The Australian Language and Literacy Policy (ALLP), or the White Paper on language and literacy policy in Australia, emerged after a period of extensive debate on literacy and schooling, first gathering significant momentum in the 1970s (Green, Hodgens & Luke, 1994). Its immediate precursor was a Green Paper published in two volumes under the title of "The Language of Australia", issued under the auspices of the then Federal Minister, John Dawkins. It focused on "literacy in English", deployed a particular understanding of "functional literacy", and made no reference at all to technology or computing. After much discussion in public and professional forums, "Australia's Language" was published, building directly on the previous document while taking into account certain criticisms and comments. In this document, language and literacy are referred to almost exclusively in economic-rationalist terms, and described as "central to the reshaping and the improved performances of our education and training systems". Moreover, "effective English literacy is a pre-condition for success in virtually all fields" (DEET, 1991a, p. 1). The document also argues that:

> Global economic forces are demanding changes in the structure of Australian industry, in our ability to compete in world markets, and in our readiness to adapt to new jobs, new career [structures], and new technologies. (DEET, 1991a, p. 1)

A broad definition of literacy is employed, so broad that it could include electronic literacies (DEET, 1991a, p. 5), though that does not in fact happen. More generally, literacy is equated with English language competence. "Effective literacy in English" (DEET, 1991a, p. 4) is presented as a key national goal, where "effective literacy" is understood as "a level of spoken and written English which is appropriate for a range of contexts" (DEET, 1991a, p. 4). Further, the formulation, "Effective literacy is intrinsically purposeful, flexible and dynamic and involves the integration of speaking, listening and critical thinking with reading and writing" (DEET, 1991a, p. 5), is consistent with the common understandings of that time.

2. Department of Employment Education and Training (DEET), (1991b). *Australia's Language: The Australian Language and Literacy Policy. Companion Volume to the Policy Paper.* Canberra: Australian Government Publishing Service.

Under the "Rationale for the Review" is the awareness of the need to take account of "the pace of technological change" (DEET, 1991b, p. 4). In the section on "Definitions", electronic forms and contexts are not directly mentioned, but could be encapsulated within these broad definitions (DEET, 1991b, pp. 8-9):

> Literacy is the ability to read and use written information and to write appropriately, in a range of contexts. It is used to develop knowledge and understanding , to achieve personal growth and to function effectively in our society. Literacy also includes the recognition of numbers and basic mathematical signs and symbols within text.

Further:

> Literacy involves the integration of speaking, listening, and critical thinking with reading and writing. Effective literacy is intrinsically purposeful, flexible and dynamic and continues to develop throughout an individual's lifetime. (DEET, 1991b, p. 9)

The document argues that if the Australian Language and Literacy Policy is to be in keeping with Social Justice policy, then "fair and equal access to essential resources" must be ensured (DEET, 1991b, p. 13). However, this remains within a traditional framework, with no account taken of technocultural resources or new forms of "information poverty".

Reference is made to "types of literacy". The point is made firmly that "different types of literacy exist" (DEET, 1991b, p. 34), and due acknowledgment is given to controversies and difficulties associated with the notion of "functional literacy". The impossibility of fixing upon any single view or understanding of literacy is emphasised, as is the point that literacy "is certainly not just a set of static, isolated skills through which people can encode and decode printed words". Hence: "The concept of functional (or 'social') literacy highlights the uses which are made of literacy skills in a particular society". The rhetorical work associated with the concept is clear. While acknowledging that functional literacy is a controversial notion, it is still clearly endorsed here: "Nevertheless, the term is used internationally and is a useful way of explaining that literacy exists in context. It also distinguishes a higher level than basic literacy" (DEET, 1991b, p. 35). The document then suggests a continuum: from "functional literacy", understood as highlighting the use of literacy skills in context and operating at a higher level than "basic literacy", to what is its preferred term, a notion of "effective literacy" ("Effective literacy should become the commonly accepted term."). This is linked to the notion of "active literacy", set explicitly in the context of "an advanced technological society like Australia"; while further along the continuum is the notion of "literacy for cultural enrichment":

> Along its continuum, literacy also includes the cultural enrichment which comes from immersion in and responsive reading of the body of Australian and world literature. It involves recognition of oral literatures, such as those of Aboriginal people. Literacy also includes the acquisition of strategies for writing, not only for pragmatic purposes, but also for personal development.

Different literacies are posited for different contexts (DEET, 1991b, p. 35), and reference is made explicitly to "community and workplace processes as well as "educational contexts"; further, that "[i]nformation processing is becoming more sophisticated, for both social participation and economic performance" (DEET, 1991b, p. 36). There is some recognition of the importance of new technologies for literacy practices in the section on the "Contexts of literacy":

> Literacy development is also influenced by prevailing technologies. For instance, many people now learn literacy skills through computers and word processors. The mass media also impact on national literacy development. A critical awareness and use of these developments form an essential part of literacy programs. (DEET, 1991b, p. 37)

However, this is left undeveloped. The main point to observe is that literacy is firmly tied to matters of national economy, and education is seen as crucial in achieving both personal and national goals in this regard: "Apart from fostering a cultural climate which encourages literacy through all sectors of society, education and training systems have a particular responsibility for literacy development", and while "English teachers and the English curriculum are the most important sources of literacy attainment in Australian schools", it is noted that "they are not solely responsible" (DEET, 1991b, p. 41).

In conclusion, the ALLP presents an official view of literacy that is more or less exclusively print-oriented, without recognising that this in itself represents a particular relationship between language and technology, namely the printing press and the publishing industry. Libraries and the media are mentioned but are not seen as directly relevant to literacy policy.

This is perhaps not all that surprising. Published in the same year, although never formally endorsed by the Government, the "Teaching English Literacy" report (Christie, et al, 1991), focused on the preservice preparation of English literacy teachers. Similarly, it evinces limited recognition of the literacy challenges associated with new technologies and technocultural change. Recommendation 27 reads as follows: "That all preservice teacher education programs should (i) teach students to use computers, developing proficiency in a range of program types, and (ii) teach students to examine the impact of such technologies upon the nature of English language, both spoken and written" (Christie et al, 1991, p. 95). Volume One of the Report concludes with a section entitled: "New Literacies for New Technologies?", and three further Recommendations pertaining to the relationship between literacies and technologies in teacher education. Attention to matters of technology appears to be something of an "add-on", however, and it is significant that there are no commissioned discussion papers on this topic in Volume Two.

3. Parliament of Commonwealth of Australia, (1992). *The Literacy Challenge: A Report on Strategies for Early Intervention for Literacy and Learning for Australian Children*. House of Representatives Standing Committee on

Employment, Education and Training, Canberra: Australian Government Publishing Service.

The terms of reference of the report concern the range and effectiveness of methods to identify children “at risk” of developing literacy problems at an early age; the range and availability of intervention strategies to address the literacy needs of “at risk” children in the early years of schooling; and the role of the Commonwealth Disadvantaged Schools Program (DSP) and the Country Areas Program (CAP) in promoting literacy development at the primary school level. The focus is thus firmly on the issue of informed intervention in the early years, with specific reference to educational disadvantage and social equity. Although intervention in the early years is perceived to be and presented as vital, with specific regard to targeting "children at risk of developing literacy problems", it is argued that this need not be at the expense or omission of intervention at other key levels, although that could be a possible reading of the Report. While this document concentrates on early intervention, it also recognises that "for some schools, the majority of the school population may be in need of special support" (Parliament of Commonwealth of Australia, 1992, p. v).

The assertion is made that "changes in the way in which reading and writing are taught have not achieved the ‘universal’ literacy outcome for children which is required if all are to later participate effectively in society as adults" (Parliament of Commonwealth of Australia, 1992, p. v), and argues in particular that change is needed in the structure and organisation of the early years. Teachers must know "which methods and approaches are likely to work with certain students", and further, "[t]hese teaching skills can only be acquired if teachers are exposed to them in preservice and inservice training" (Parliament of Commonwealth of Australia, 1992, p. v). However, "Current preservice education may not fully equip students for their role as effective classroom teachers. They must be able to use a multiplicity of strategies to assist the range of students they will encounter in their classes. Some foundations in language and literacy are seen as essential to all aspects of a child’s learning".

The document therefore argues for the extension of teacher training to four years and system-wide inservice training programs. In summary, the document calls for "a Nation dedicated to universal literacy", with the aim that "every Australian must be able to read and write in English"; "a national commitment to effective literacy education from the beginning years"; "appropriate resources for education in the early years"; "highly trained and motivated teachers"; "teacher training and practice that embraces a range of strategies”; and "effective strategies forremediation". A number of strategies for assessing and reporting literacy outcomes are also included, which can be seen to have laid the groundwork for the extensive testing that was to be implemented subsequently. Importantly, these recommendations were to be accompanied by new funding arrangements, which as it happened did not eventuate. Also, particularly in the context of staffing and skilling, one issue worth noting here is a recommendation (Parliament of Commonwealth of Australia, 1992, p. vii) that an investigation be made of the likely effects of teacher aides on literacy outcomes.

Clearly, the emphasis is firmly and exclusively on print literacy. No account is taken of the emergence during the 1980s and into the 1990s of a distinctive “Nintendo” culture organised around computer and video games, or of the significance for young children

of television and other forms of media culture. Indeed, it would be interesting to transpose the needs of teachers in regard to the teaching of "electronic literacy" where it says just reading and writing. This would produce a direct and succinct statement about the new forms of training and pedagogies required to cope with the electronic era.

4. Curriculum Corporation, (1994a). *A Statement on English for Australian Schools* Carlton: Curriculum Corporation.

The links between this and the other Statements (and accompanying Profiles), and the issue of national curriculum more generally, need to be taken into account here. Several points can be made. The first concerns the relationship between literacy and the English KLA. Although it is clearly the case that English constitutes a significant domain with regard to the literacy learning demands of the school, literacy and learning are by no means exclusive to the English subjects. The second suggests that it is appropriate to look at the other KLAs to ascertain what account is taken of literacy and literacy learning in them, and the extent to which literacy is a genuinely across-the-curriculum concern. Stewart-Dore (1996) organises the KLAs as a whole into four groups: *A.* English, Languages Other Than English (LOTE); *B.* Studies of Society and the Environment (SOSE), The Arts, Health and Physical Education; *C.* Science, Mathematics; and *D.* Technology. Of these, English and LOTE have a clearly articulated language and literacy mandate. Group B considers different aspects of literacy, as does Group C, across different aspects of their "Process" and "Content" strands, while the Technology KLA in this account refers to specific aspects of literacy in its "Information" strand (Stewart-Dore, 1996, p. 13). Crucially, literacy is to be understood here as primarily verbal-linguistic in nature—something that, rightly, Stewart-Dore observes critically. As she puts it, what is needed is a *multimodal* view of literacy (Stewart-Dore, 1996, p. 18). The key point to emphasis here is that what characterises the entire array of KLAs is an overall commitment to *print* literacy—that is to say, with the exception of Technology, literacy and learning are understood with reference primarily to matters of language and text, with limited and restricted reference to matters of technology and information.

In what follows, the English KLA is examined specifically in terms of its references to technology and its understandings of the connections between literacy and technology. The first thing that needs to said is that the English Statement remains clearly and emphatically within the ambit of print culture and literacy. It seeks to make certain connections with media and computing, consistent with its emphasis on, and extended understanding of, the notion of "text", but clearly print and its associated forms of literacy and rationality remains the organising focus.

Technology is not included in the "Goals of the English Curriculum" (Curriculum Corporation, 1994a, p. 3). This is not surprising, since it took until 1994 for "viewing" to be officially included and acknowledged as an important literacy and, indeed, one of the key multiple literacies required to participate meaningfully in society. Similarly, even though "electronic literacy", or "reading and writing with computers", is increasingly a feature of the workplace, as well as of our schools, and has been for some time, in this document it is not perceived to be intrinsic to understandings of literacy.

The Texts and Language strands do not include references to technology (Curriculum Corporation, 1994a, p. 6). For example, the Texts strand could include electronic texts, such as email, electronic conference texts, hypertext; while the Language strand could include knowledge about electronic language and the skills required to use it effectively.

In the "Mass Media" texts category, mass media texts in electronic form are included. Further, there is an awareness of overlap between texts (Curriculum Corporation, 1994a, p. 6). However, “Contemporary literature” could include hyperfiction or “interactive fiction” as already do an increasing number of tertiary literature programs (Curriculum Corporation, 1994a, p. 8). Similarly, "Popular literature" could include video or computer games (Curriculum Corporation, 1994a, p. 8).

The document argues that mass media texts "are more than most other texts, shaped by the technology used in their production" (Curriculum Corporation, 1994a, p. 9). However, printed text is as much shaped by technology as is a video or a hypertext. It is probably because they are so familiar that they are perceived as “natural” rather than as “technical”, or a product of technology. The example given is TV, but the Internet and the World Wide Web could equally have been mentioned. Similarly, in "Everyday Texts" (Curriculum Corporation, 1994a, p. 10), examples of electronic texts, such as messages on Bulletin Boards, Home Pages, email etc, could have been identified.

In the "Language Strand", under "Contextual Understanding and Situational Context" (Curriculum Corporation 1994a, p. 10), the sociocultural context of cyberspace might well have been included. There is reference to "handwriting, keyboarding and use of communication boards" in the section concerned with the development of students’ knowledge and skills in written language (Curriculum Corporation, 1994a, p. 13). This section incorporates the importance of film, video and visual texts and their composition and structure, but makes no specific reference to electronic forms. Further, while mention is made of the importance of presentation, it is not directly linked to the use of presentation technologies (cf. Snyder, 1993a).

Under "Strands for Reading and Viewing" (Curriculum Corporation, 1994a, p. 14), the demands of computer reading are not considered. Under the heading "Strategies for writing" (Curriculum Corporation, 1994a, p. 15), spellcheckers are mentioned, which assumes use of computers. However, it could be argued that writing strategies are so different with the use of the computer that the components of writing, listed here as part of a six-step linear process, are not very useful. The blurring of boundaries between these stages and the continuousrecursivity associated with computer writing arguably make computer writing an altogether different experience/process. Further, the “instantaneity” of the response of the machine is something that needs to be taken into account.

These comments about omissions in the Strands apply equally to the specifics of the Bands. In Band A, mass media texts are included but none of the digital-electronic variety (Curriculum Corporation, 1994a, p. 19). There is an emphasis on the importance of developing legible handwriting, but no equivalent focus on keyboarding

skills (Curriculum Corporation 1994a, p. 20). The document recommends predicting a book's content from its cover picture (Curriculum Corporation, 1994a, p. 21); equivalent activities could be noted for a Home Page, the opening window of a hyperfiction or the opening frame of a video game. Within the "Broad Outcomes" (Curriculum Corporation, 1994a, p. 21), the assumption is that the aim is to make students literate in print culture. Within Band B, under "Mass Media", the texts here include "computer programs and video games" (Curriculum Corporation, 1994a, p. 24), while in the "Broad Outcomes", media texts are referred to directly (Curriculum Corporation, 1994a, p. 27). In Band C, the emphasis includes "developing in students a critical understanding of the mass media and the difference between various media text types" (Curriculum Corporation, 1994a, p. 28). However, the references to literary theory which follow are print-based (Curriculum Corporation, 1994a, pp. 28-30). This section talks about continuing to emphasise "the similarity between film and other narrative texts such as novels", but it does also point to different elements of style and structure (Curriculum Corporation, 1994a, p. 29). The "grammar" of film is perceived as intrinsic to the English Statement; a similar reference to the "grammar" of computing could also be made (Curriculum Corporation, 1994a, p. 30).

Within "Using Evidence to Support a Point of View", teachers are invoked to teach students "strategies such as making margin notes in texts while reading, or constructing a running sheet for a film" (Curriculum Corporation, 1994a, p. 31). They could also be expected to teach students how to mark up an electronic text using, for example, the "review" function in *Word* which changes the colour of the text that is inserted as a commentary, or how to use Bookmarks on the World Wide Web. The examples of text types could also include electronic texts.

Within "Language strategies", attention to extending student's knowledge of how to read texts for information is print-oriented (Curriculum Corporation, 1994a, p. 34). Similarly, in Band D, the "mass media" section is generally print- and TV-oriented (Curriculum Corporation, 1994a, p. 38). Examples could suggest creating a MOO as well as a magazine or a TV show.

With regard to "Broad Outcomes" (Curriculum Corporation, 1994a, p. 41), if the aim of literacy education is to enable students to "leave school with the language knowledge, skills and attributes to enable them to participate equitably in society, and to successfully make the transition to employment and further education", the document has some serious omissions. It is overtly print-oriented and in effect ignores that we now live in a technoculture in which we deal with different kinds of texts and different forms of texts. The explanation of the term "author" is revealing: "speakers, writers, film-makers" are included, but constructors of electronic texts are omitted (Curriculum Corporation, 1994a, p. 42).

Overall, the invocations to teachers are framed in the language of print culture. Although there are many aspects of literature and languages which are common to both technologies, there are also many that are exclusive to each. It would be useful and appropriate to signal to teachers some of the important distinctions between the two technologies. Teachers would then be better able to engage in teaching and learning activities which strengthen students' capacities to operate effectively in the use of the new technologies.

5. Curriculum Corporation, (1994b). *English—A Curriculum Profile for Australian Schools*. Carlton: Curriculum Corporation.

As would be expected, the Profile is consistent with the Statement in regard to literacy and technology. Clearly, it would be possible, within the structure of the strand organisers, to accommodate digital-electronic literacy. Within the category "Texts", different kinds of electronic texts could be included. Within “Contextual Understanding”, the contexts of the computer, the Internet, and of the World Wide Web could be noted. "Linguistic Structures and Features" could distinguish between those that are the same and those that are new, and even exclusive, to the new technologies. It would be possible, further, to identify the re-emergence of particular genres, with reference also to such practices and forms as pastiche and collage. Similarly, “Strategies” could indicate that new strategies are required to operate effectively in the new spaces.

Computers are specified as useful with students with disabilities or impairments. They are, but they also have many possibilities for mainstream use (Curriculum Corporation, 1994b, p. 4). Level 1 "Writing" includes a reference to the use of a word processor to produce written "messages" (Curriculum Corporation, 1994b, p. 22). In Level 2 "Writing", there is no sense that writing is anything but a print technology. Level 6 "Writing", under "Strategies", the document does refer to the use of "strategies to improve sequence and coherence in writing (cut and paste paragraphs using either paper or a word processor)" (Curriculum Corporation, 1994b, p. 123).

6. Curriculum Corporation, (1994c). *A Statement on Technology for Australian Schools*. Carlton: Curriculum Corporation.

The Technology KLA is organised into four interdependent strands of learning: Designing, Making and Appraising; Information; Materials; and Systems. The first of these constitutes a “Process” strand, while the other three make up what is effectively a “Content” dimension:

> The four strands of learning together provide unity of purpose and direction across all areas of study in technology. Learning tasks and activities are directed towards development of the students' knowledge and capabilities in each strand. *The Designing, making and appraising strand is developed in all activities, and the relative emphasis on Information, Materials and Systems varies according to the challenges and tasks* (Curriculum Corporation, 1994c, p. 9; emphasis added).

“Designing, making and appraising” is to be understood therefore as *technological practice*, or as a generic way of “doing” technology, that is, working technologically towards the achievement of distinctively technological goals and purposes. Thus designing, making and appraising is represented as essentially a linear and rational process, and no account is taken of the possibility that actual forms and instances of technological practice might well be less orderly and sequential, and less rationalist in its execution. In this way, technology is presented here as both mentalist and

abstract, consistent with the logic and discourse of information technology (Bigum and Green, 1993).

A key role would appear to be assigned to the "Information" strand. It is significant that it is presented first in the set of Content strands, and is thereby foregrounded as a matter of curriculum consideration. It can also be argued that the concept of "information" pervades the document as a whole, and indeed the new curriculum formation of the Technology subjects, further registering the organising or shaping influence of the information-technological mindset. The Technology KLA brings together the following areas of study, differently deployed in and across the strands: Agriculture; Computing/Information Technology; Home Economics; Media; Industrial Arts, Manual Arts, Design and Technology (Curriculum Corporation, 1994c, pp. 5-6). This in itself presents difficulties in terms of the formulation of "subject-specific", or even what might be called "domain-specific", literacies. What might provide a link here, although it is not made explicit, is the likelihood of increasing *abstraction* in curriculum practice, which in turn can be associated with the characteristically abstract and "essayistic" nature of school literacy.

The "Information" strand is usefully described by Stewart-Dore (1996, p. 13) as "implying that literacy is an information processing technology involving the practice of verbal and non-verbal competencies". Presenting "information" as "knowledge generated and used in everyday life", the Statement goes on thus: "Information can be stored, retrieved and communicated, using sound and visual images, including print, numerical, pictorial and graphical representations". Moreover: "The techniques of gathering, sorting, storing, retrieving, transforming and communicating information are an important technology, and one used in solving challenges across many areas of learning" (Curriculum Corporation, 1994c, p. 10). Hence:

> Working with information gives students opportunities to:
>
> - synthesise information in visual, sound, symbolic and electronic forms;
> - edit, format and publish information in the form of texts, models, simulations and graphical representations;
> - acquire and convey information to a variety of audiences through a variety of media;
> - use and adapt hardware and software for managing information;
> - create ways of organising and communicating information
> - understand the nature and uses of information;
> - analyse, interpret and predict patterns and trends in information;
> - assess the reliability and relevance of information;
> - explore the social, cultural and political effects of information technology;
> - gather, use, store, retrieve, process and transform information;

- analyse and present information in ways that are gender and culturally inclusive. (Curriculum Corporation, 1994c, pp. 10-11).

This is clearly an account of “information literacy”, although that formulation is not employed here, and hence the opportunity is missed to make quite specific connections between literacy and technology. What is also noticeable is a constant intermingling of “technical” and, as it were, “textual” aspects of information handling and processing, as well as what is clearly a significant potential for *cultural-critical* emphases in curriculum and literacy practice. Further indication of the congruence of literacy and technology consideration is provided in the elaboration of what students are to “design, make and appraise” in the area (Curriculum Corporation, 1994c, p. 16). This ranges through domains (business, home, recreation), artefacts, genres and media (televisions, telephones, computers, video games, calculators, photocopiers, compact discs, audio- and video-tapes, cameras, books, print, catalogues, maps, electronic displays, cartoons, diagrams, graphics, speakers, screens, VCRs, etc.).

7. Curriculum Corporation, (1994d). *Technology—A Curriculum Profile for Australian Schools*. Carlton: Curriculum Corporation.

“Outcomes” are presented, firstly, in terms of their “nature” and their “techniques” and in the case of the Content strands, and in the case of "Designing, Making and Appraising", in terms of the processes of “investigating”, “devising”, “producing” and “evaluating”; and secondly, with reference to and across eight “levels” corresponding to the various stages of schooling, K-12. Level 3, for example, focuses on both the “theory” and “practice” of how information can be "created, constructed, stored and transmitted in different forms for particular audiences and users". It also addresses techniques "to manipulate, transmit and transform information when creating information products" (Curriculum Corporation, 1994d, p. 10), and hence relates to both “critical” and “creative” activity. Some of the suggested activities for Level 1: Information includes "[identifying] differences between a storybook and a video of The Rainbow Serpent", "[recognising] how different characters are presented in story books, cartoons and TV programs", as well as "different types of information (recipe, story)", "[using] a touch pad to arrange shapes and colours to create a computer image" and "[working] in pairs using a computer keyboard and mouse to select graphics" (Curriculum Corporation, 1994d, p. 20). Level 5 activities in this strand include "[comparing] different layouts for a school handbook to determine their likely impact on parents", "[describing] the nature and order of the links between different screens in a computer game" and "[producing] a database on family histories, movements and interests" (Curriculum Corporation, 1994d, p. 64). A comprehensive outline is thus available for generating a range of possibilities in terms of purposeful classroom activities linking literacy and technology.

8. National Board of Employment, Education and Training (NBEET), Australian Language and Literacy Council (1995a). *Teacher Education in English Language and Literacy*. Canberra: Australian Government Publishing Service.

The document uses the definition of literacy in “Australia’s Language” (DEET, 1991a), and also, as noted above, uses the concept of "effective literacy" (DEET, 1991a, p. 8).

Prominence is given to the new technologies by foreshadowing their importance in the introduction to Chapter 2, in the section entitled "Setting a context": "While the literacy modes of reading and viewing, writing, listening and speaking have a relatively long history of attention in the literature, it has been only in relatively recent times that due attention has been given to what can be called multimedia and information technology literacy" (NBEET, 1995a, p. 13). Clearly, there has been an overt decision to give attention to "multimedia and information technology literacy"—indicating how recent the recognition of these challenges and contexts for literacy has been. The major policy documents since “Australia’s Language” are listed (NBEET, 1995a, p. 20), with specific focus on those relating to literacy and English, suggesting that this account is embedded within the policy context.

The document points out that new literacies are integral to being critically literate in these new contexts (NBEET, 1995a, p. 27). It cites the Christie Report’s (Christie et al, 1991) invocation to both embrace the new technologies but at the same time to be wary, observing that technology offers exploration of realms of “creativity” and “knowledge”, but may also lead to undesirable increases in “surveillance” (NBEET, 1995a, p. 27). Further, the document advises of the need to be wary of extreme positions (NBEET, 1995a, p. 28). The need for sensitivity toward the equity issues raised by the new technologies is also included.

"Technological change" is intrinsic to the document’s argument for the importance of ongoing Professional Development for teachers (NBEET, 1995a, p. 29). Further, when addressing future directions, Beare (1995) is cited to the effect that there needs to be a radical rethinking of teachers' workloads:

> It seems silly to define a teacher’s workload in terms of student contact hours, class size and subjects taught because that puts a straitjacket over the ways a school can set up programs for its students and does not acknowledge the new learning modes resulting from computer technologies, “Nintendo methods” and new subject treatments. (NBEET, 1995a, p. 63)

While learner competencies are in the English Profile, teacher competencies required to teach English literacy through the application of the Statement and Profile are not explicit even though they should be (NBEET, 1995a, p. 76). In the section on "Quality assurance", there is a reference to Corcoran’s discovery of a compulsory unit in language and education in many institutions which required "a satisfactory level of competency in word processing" (NBEET. 1995a. p. 91). At best this is a minimal requirement. There is clearly awareness of the need to add to teachers' competencies in the use of the new technologies:

> The case for incorporating computer and multimedia literacies within the competencies of teachers is compelling—even if some of the more extreme “futuristic” claims being made for the transformation of the universe by such technologies deserve firm critical enquiry at best, and enlightened scepticism at worst. Contemporary teacher education through the preservice and especially, professional development modes must empower

> teachers to be able to maximise the literacy teaching potential of multimedia technologies by being able, for example, to develop teaching resources using hypertext and CD-ROM, to be aware of the literacy teaching and learning implications of emerging film and video technologies, and to integrate multimedia technologies into all aspects of their teaching as teachers of literacy. (NBEET, 1995a, p. 92)

The document also stresses that in this rather than in any other area of literacy, being able to "learn how to learn" will be crucial.

The Christie Report's Recommendation 57 is endorsed:

> That all students should be required to learn to use computers in their course work, with the aim of attaining a basic technological proficiency in at least the following: word processing, principles of electronic text design and publication; using printers, modems and other peripheral devices; designing hypermedia programs; and exchanging electronic data on a network. Ideally, these skills will be supplemented by an understand of the current software copyright regulations and telecommunications laws. (Christie et al, 1991, p. 223)

Similarly, in the context of Adult Literacy education, the document points to the need to "enable teachers to understand and teach the “newer”literacies demanded by multimedia communications and developments in information technology" (NBEET, 1995a, p. 94).

These elements and observations signal shifts in direction. In a relatively short time, a clear acknowledgment has emerged of the role and significance of computer-based technologies in and for English teaching and their associated forms of pre- and in-service teacher education.

9. Parliament of Commonwealth of Australia, (1991). *Australia as an Information Society: Grasping New Paradigms*. Report of the House of Representatives Standing Committee for Long Term Strategies. Canberra: Australian Government Publishing Service.

Under the direction of Barry Jones, this report can be seen retrospectively as ushering in due and even belated consideration of the so-called information society and its implications for Australia. Consistent with the tenor of the times, information is presented first and foremost as an economic commodity. Considerable attention is directed therefore to the information sector and employment opportunities, with the sector seen as increasingly significant in terms of providing for growth in both national income and jobs, indeed, in this regard, replacing primary and secondary industries in the national economy. Something of this industry orientation can be gauged in the following:

> "Information employment" is characterised by the collection, processing and dissemination of data or knowledge and its common element is the use of symbols, such as words, sounds, numbers and images, or symbolic objects which represent value (title deeds, bank notes, cheques) or represent the symbols in a tangible form (letters, books, photographs, keys, betting slips, examination papers, shares and insurance certificates). Its products are often intangible and can be transmitted electronically. (Parliament of Commonwealth of Australia, 1991, p. 9)

Moreover: "Typical tools of the trade in the sector are telephones, computers, typewriters, word processors, cameras, pens and chalk" (Parliament of Commonwealth of Australia, 1991, p. 9). An important distinction is positioned between "information" and "information technology":

> Information technology is an essential element in the processing of information transactions but "information" and "information technology" are not synonymous. "Information is a far broader concept, emphasising content, not the instrument being used. It is important not to confuse policies encouraging the manufacture and use of hardware/software with the need to develop content, make it readily available, and use it as an instrument to solve personal, national and global problems. (Parliament of Commonwealth of Australia, 1991, p. 20)

Although, as already noted, the main thrust of the document is on the relationship between information and the economy, acknowledgment is made of the broader role of information in an educated society, as indicated in the view taken of information and social relations and transactions, with information seen as crucially "involv[ed in] transfers and relationships within society and between individuals":

> If, in addition to building our economy on a base of strong and active information industries, we can also ensure community access to information we will not only progress towards becoming the clever country but we will also become an equitable and aware clever country. (Parliament of Commonwealth of Australia, 1991, p. 25)

Most importantly, however, information is posited as an appropriate and proper object of policy. Among other things, accordingly, National Information Policy should address the "disparity between the 'information rich' and the 'information poor', with its significant class, regional and ethnic implications, suggesting that as the national skill base rises, large groups of citizens may suffer increasing disadvantages through lack of access to information" (Parliament of Commonwealth of Australia, 1991, p. 20). While account is made of the problem of *access*, this remains relatively rudimentary and restricted, with the emphasis falling in effect on the more technical aspects and dimensions of the problem, albeit in an explicit social inequality frame.

Furthermore, an attempt is made within this frame to develop a more sophisticated notion of “information” itself, and of its associated forms of competence and skill, knowledge and awareness: "To reduce social inequality while realising the potential of the information society, we need to broaden our concept of information to include the social, political and cultural roles of information"—although it must be said that these roles and aspects are left largely undeveloped. The point is made quite strongly that there is "a need for people to develop information awareness and skills in a more concerted way than is currently the case in education", although the focus falls more directly on the tertiary sector in this regard:

> At the tertiary level there is a need for all graduates to have an understanding of the links between values and information as well as information handling skills. There is also a need for specific programs to be put in place at all three levels of education to develop information handling skills in students. These programs should allow for the subtle nature of information and not be equated with computer skills. (Parliament of Commonwealth of Australia, 1991, p. 26)

A good basis therefore is laid for subsequent educational initiatives of this kind, and indeed the importance of education in such debates and deliberation is made very clear: "Information is . . . at the core of education" (Parliament of Commonwealth of Australia, 1991, p. 37). Hence, education is one of twenty-one key elements to be taken into account in a National Information Policy, presented in this order: 1. The Right to Know; 2. Industry; 3. Scientific and Technological Information; 4. Intellectual Property Law; 5. Transborder Data Flows; 6. Sovereignty; 7. Defence; 8. Telecommunications/Media; 9. Media Ownership and Control; 10. Libraries; 11. Archives; 12. Public Accounting Information; 13. Social Justice; 14. Privacy; 15. Education; 16. Information Research; 17. Information Statistics; 18. Promoting efficient/effective information use; 19. Promoting Critical Evaluation of Information 20. Consumer Information 21. Copyright. With specific reference to Education: "information *retrieval*, including data base searching, should be regarded as a fundamental skill at all levels of education” (Parliament of Commonwealth of Australia, 1991, p. 50, our emphasis). As well, explicit reference is made to the issue of adult literacy, specifically within the context of employment and the economy: "The extent of adult functional illiteracy, estimated to be in the region of 1,000,000 people, two thirds from English speaking backgrounds, suggests that Australia may have some difficulty in making the transition to the production of sophisticated, high value-added goods and services." (Parliament of Commonwealth of Australia, 1991, p. 50). In the end, though, the view taken of education is a limited and curtailed one, the effect of which is to weaken the overall account of information and Australian society.

However, a new social vision is at least intimated in this regard, with implications for citizenship, culture and education:

> The sheer complexity of modern urban life, with its proliferation of laws and authorities makes it hard enough for educated, computer literate citizens to keep abreast of change: the task may defeat citizens without such skills, leading to a widening

> gap between the “information rich” and the “information poor”. (Parliament of Commonwealth of Australia, 1991, p. 38)

Emphasis is placed firmly on the *use* of information, not simply its accumulation, and an important move signalled towards making crucial distinctions between “information” and “knowledge”, and in "sort[ing] the useful ‘information’ from the data in which it is embedded":

> Much has been said about the explosion of information. However the explosion has been in words rather than content – while the amount of information available is increasing at an alarming rate, additions to our national store of knowledge are increasing rather more slowly. (Parliament of Commonwealth of Australia, 1991, p. 38)

Further:

> It is essential to distinguish between the existence of information resources such as data bases, libraries and archives and their effective use. Considerable public and private expense is incurred in acquitting information which is then not used efficiently so that its value deteriorates in time. Priority must be given to the use and users of information, rather than to putting elaborate structures in place to supply information in the first instance. (Parliament of Commonwealth of Australia, 1991, p. 50)

In this fashion, a key strategic role for education is suggested, although not as explicitly as one might expect, specifically in terms of "[s]timulating information use, through developing the ability of organisations and individuals to use information" (Parliament of Commonwealth of Australia, 1991, p. 50). What this might mean in practice and in detail, however, is left undeveloped.

An emerging theme over the period in question here is that of *convergence*. It features in the Australian Education Council (AEC) (1991) report on "Young People’s Participation in Post-Compulsory Education & Training", referring both to general and vocational education, and to the notion of the convergence of work and learning, with "regular updating of skills and knowledge" seen as "essential to maintaining and enhancing productivity in the workplace” (AEC, 1991, p. ix). A key Recommendation is as follows: “Australia as a nation should be committed to providing for all of its young people a program of education/training which prepares them for life as individuals, citizens and workers now, through the current decade and into the coming century" (AEC, 1991, p. xv). Science and technology are to be seen in the context of a new emphasis on Competencies, presented specifically as "skills and knowledge-based", and moreover, as a key area of competence in itself. Although there are clearly possibilities in such an account for making connections across Competencies—for instance, Language and Communication (addressed to speaking, listening, reading, writing, and "accessing and using information" [AEC, 1991, p. xvii],

Cultural Understanding, and Scientific and Technological Understanding (addressed to understanding scientific and technological concepts and the impact of science and technology on society, as well as the development of "scientific and technological skills including computing skills" (AEC, 1991, p. xvii)—connections of this kind are never made explicit.

The convergence theme is carried through the report of the Broadband Services Expert Group, "Networking Australia's Future" (NBEET, 1994), and the NBEET (1995b & 1995c) discussion paper "Converging Communications and Computer Technologies" and the "Converging Technology, Work and Learning" report, both from 1995. In the second of the two reports, it is interesting to note how education is drawn in. The report considers the need to examine "the impact of convergent communication and computer technologies on the nature of work, work organisation, productivity and quality", with regard to "direct and indirect employment consequences", related forms of "knowledge, skills and attributes" so as to best exploit technological development, and the "ability of the education and training systems to equip the work force and the community more generally" with the “skills” in question (NBEET, 1995c, p. xvii). Attention is drawn to various forms of convergence—not simply technological but cultural and institutional as well. Telecommunications, broadcasting, computing, and their associated cultures and industries, are referred to explicitly, in this regard. Intriguingly in this context, there is little direct reference to publishing and the print media, although these may well fall into the context of information services more generally, and increasing reference is made to the convergence of information and entertainment, and education and work, and their respective domains. A marked “futures” orientation and rhetoric emerges, with technocultural changes of this kind seen as having "profound implications for the way people will work, interact, educate and entertain themselves in the future" (NBEET, 1995c, p. 4).

A further key term to emerge is that of *learning*, linked directly to notions of information and technology, and more specifically literacy and computing. Although the emphasis is still on cultural and economic change in the context of information and knowledge, signs are emerging of a re-orientation towards a learning-based society, with all that this implies for education. Awareness clearly exists of the risks of “technocentric” thinking:

> Improved learning and innovation will not occur just because these existing and emerging technologies exist. Combining the technologies with new pedagogical approaches and new ways of working in the education and training institutions can provide better learning outcomes. (NBEET, 1995b, p. xviii)

This is presented as "[a]t the very least . . . better ways to deliver learning opportunities to the community and the workplace" and as "an important complementary resource for teachers". Emphasis is given to the development of "computer-based skills", understood in terms of "firstly, learning how to use a computer and, secondly, learning how to use a computer as an aid to the learning process itself” (NBEET, 1995b, p. xviii).

10. Commonwealth of Australia, (1994). *Creative Nation: Commonwealth Cultural Policy*. Canberra: National Capital Printing.

A key document in this context, the “Creative Nation” policy statement, seeks to highlight the role and significance of *culture*—cultural practice and cultural development—in Australian social formation, at both the national and the individual level. In so doing, it represents a matter of historical importance, in thus positing culture as itself an object of national policy. Although there are no direct links made to debates or policy on literacy, nonetheless the document clearly has relevance to literacy matters, due to the historical linkage of issues of nationality and nationalism, print-capitalism, and the institutions and practices of modernity.

Australian culture is understood as "encompass[ing] our entire mode of life, our ethics, our institutions, our manners and our routines, not only interpreting our world but shaping it” (Commonwealth of Australia, 1994, p. 1), and as "an exotic hybrid", flourishing not just because of the increasingly multicultural orientation of the population but more specifically and increasingly because of the "the global awareness created by the electronic media" (Commonwealth of Australia, 1994, p. 1). There is, however, a certain tension and ambivalence in the view taken here of culture, since this emphasis on cultural diversity and technocultural change sits rather awkwardly alongside a more traditional aesthetic understanding (“high culture”): "The most highly developed and imaginative aspects of our culture are the arts and sciences which are fed back to the community by the most talented individuals” (Commonwealth of Australia, 1994, p. 1). Further, in the Introduction there is specific reference to notions of “heritage”, “identity”, “self-expression” and “creativity”, and to "the twin goals of democracy and excellence". The links to the history and character of English teaching are clear in this latter formulation, as are its implications for literacy.

Particular emphasis is placed on the challenge of what is described as an "unprecedented threat" (Commonwealth of Australia, 1994, p. 6) to Australian culture, as "the information technology revolution and the wave of global mass culture potentially threatens that which is distinctly our own" (Commonwealth of Australia, 1994, p. 6). The task is therefore to "ensure that what used to be called a cultural desert does not become a sea of globalised and homogenised mediocrity" (Commonwealth of Australia, 1994, p. 7). However, the appropriate attitude to adopt is a positive one, which is "why we must address the information revolution and the new media not with fear and loathing, but with imagination and wit":

> We have to see the extraordinary opportunities for enjoyment and creativity it contains. We have to embrace it . . . recognising that we can turn the remarkable power of this new technology to a democratic and creative cultural purpose. It can inform us and enrich us. It can generate new realms of creative opportunity. (Commonwealth of Australia, 1994, p. 7)

This is offered as part of the reason why a significant part of the document is "concerned with the revolution that is already changing our lives" (Commonwealth of

Australia, 1994, p. 7)—new technologies and their associated challenges and changes. A further point of emphasis here is the close relationship between culture and economy, such that "[t]his cultural policy is also an economy policy":

> Culture creates wealth. Broadly defined, our cultural industries generate 13 billion dollars a year. Culture employs. Around 336,000 Australians are employed in culture-related industries. Culture adds value, it makes an essential contribution to innovation, marketing and design. It is a badge of our industry. The level of our creativity substantially determines our ability to adapt to new economic imperatives. It is a valuable export in itself and an essential accompaniment to the export of other commodities. It is essential to our economic success. (Commonwealth of Australia, 1994, p. 7)

Hence, just as literacy policy is largely framed by economic agendas, so too is cultural policy.

There are two chapters of direct relevance: one devoted to multimedia ("Cultural Production in an Information Age" [Commonwealth of Australia, 1994, p. 55]) and the other focused specifically on education ("Education and Training"). More broadly, there is an emphasis on arts and cultural education and related forms of "skill" development, and throughout the document a recurring concern with "content". A key role is assigned to the Australia Council, and specific reference is made in this regard to education:

> The Council must continue to work closely with schools and post-secondary education institutions. In a healthy artistic culture, those who enjoy the arts activities most, understand something of the artistic traditions in which they are embedded, and are thus better able to engage with them critically. Education has a major responsibility in this area. (Commonwealth of Australia, 1994, p. 14)

Moreover, what is crucial here, it is stated, is not simply "skills formation" but rather "a broadly based education system that focuses on a comprehensive range of educational values including imagination and creativity as well as skills". With the aim being one of "developing audiences for Australian creative work", across the media, the focus goes beyond "formal education institutions" to draw in "the parallel education system, which includes libraries, museums, historical societies, open learning and continuing education agencies, film and television and the like". Indeed, this is another desirable form of convergence, and "[f]nding the mechanisms to break down the barriers that have traditionally existed between these different education systems" is an important challenge. Reference is also made in this context to the need to take account of "changes in youth culture", and to the possibilities of synergies forming between what might otherwise be traditionally quite different policy portfolios (e.g., Education, on the one hand, and Communication and the Arts, on the other). Perhaps most significantly, "high priority" is assigned to "the process of generating Australian content for the information superhighway", a theme that has

immediate pertinence for educational practice and also and more specifically for areas like English teaching.

Information technology is the focus of the chapter on “cultural production in the information age”. Importantly this is seen not so much in technical or “hardware” terms as in its cultural dimensions and possibilities:

> Today information technology offers a wide medium for the exchange of information and ideas. Text, graphics, sound and image can now be deployed to provide not simply data but concepts and understanding, creative elements that can expand horizons and devices that can engage the mind in contemporary activity. (Commonwealth of Australia, 1994, p. 55).

Hence: "Information technology, and all that it offers has crossed the technical Rubicon into the realm of consciousness, to the realm of culture". Within this, "interactive multi-media" is the more specific focus, seen as providing "instruments which allow us to shape information in so many forms that they can become an integral part of our life's experience" (Commonwealth of Australia, 1994, p. 55). Links are asserted between national identity andtechnocultural change of this kind and this order:

> If as a nation, we can create a vibrant multimedia industry, we will go a long way to ensuring that we have a stake in the new world order yet retain a distinctly Australian culture. Multimedia can provide us with an important new form of cultural expression and a major product to sell to the world. It will also provide new ways of accessing the storehouse of our intellectual and creative inheritance. (Commonwealth of Australia, 1994, p. 55)

Moreover:

> Interactive multi-media has the potential to become a new force in education, art, culture and service and the biggest information business in the world. It will change the way we communicate, the way we learn, the way we do business, the way we create, the way we live our daily lives. (Commonwealth of Australia, 1994, p. 55)

To this end, a comprehensive program of industrial and educational development is envisaged, with the emphasis falling not simply on infrastructure—although clearly that is crucial—but on developing creative skills and capacities, knowledges and attributes. Hence "content producers" need to be developed as well as "service providers", linked up in turn directly to the notion of audience development. Education is immediately implicated in this regard:

> The starting point to realising our potential in multimedia products is to build a critical pool of talent with multimedia skills. For most part, the talent is located in young people in education

> or working in small companies around Australia. Our schools and our tertiary institutions need to meet the challenge of new information technologies. We need to generate greater dialogue and interaction between traditional content producers and the software experts. (Commonwealth of Australia, 1994, p. 57)

This requires new articulations between education and industry, and also new forms of alliance and cooperation between literacy, the arts and technology, and their respective industries and constituencies. The emphasis, further, is firmly on the young, on new and emerging generations, as presumably closest in spirit to new technocultural innovation and development:

> Obviously, it is young Australians who will best embrace the information waves. They are the ones who are already picking up the new technologies with enthusiasm. They represent the way forward. If we can take steps now that will realise the enormous potential that exists in our youth, we will travel a good distance to setting them up with the sorts of skills they will need to ensure that Australia prospers in the twenty-first century and that Australia remains an originator of culture. (Commonwealth of Australia, 1994, p. 58)

The need for education, accordingly, to be futures-oriented is very clear, as is the promise and the necessity of information technology in this regard.

A separate chapter focuses on education itself, significantly linked to training, and with particular reference to arts education and "the provision of education for practitioners and for audiences". Importantly, "[r]apid developments in technologies" are seen in direct relation with "the cultural industries", and "commitment to training in new forms of technology" seen as essential if Australia is to maintain and enhance "its global reputation for innovation in the arts". Education is surveyed across four sectors: schools; professional training; vocational education and training: and what is called "parallel education". In the case of schools, the focus is on arts learning and appreciation, with "primary and secondary education" seen as playing "a fundamental role in developing a capacity for, appreciation of, and participation in, the arts". Little direct reference is made in this context to technology. However, later sections on “open learning” and the “parallel education” education begin to make this link more explicit. Libraries figure heavily, for instance, in the section on "information for all Australians", with information viewed as "a key resource” for both citizenship and "our quality of life". “Networking” is seen as crucial in this respect, and specific emphasis is placed accordingly on making the best use of "the new networking technologies".

Once again the convergence theme is made explicit, in terms of "the convergence of communications and information technologies and the application of state-of-the-art technology to cultural and heritage institutions", thus helping to define Australia internationally and providing electronic gateways to "the rest of the world". Although the literacy links are never articulated, nonetheless there are immediate implications in these arguments and proposals for the aesthetic and cultural dimensions of literacy education.

11. Tinkler, D., Lepani, B., & Mitchell, J., (1996). *Education and Technology Convergence: A survey of technological infrastructure in education and the professional development and support of educators and trainers in information and communication technologies* Commissioned Report No. 43. Canberra: Australian Government Publishing Service.

The last national level document to be surveyed here is particularly pertinent to the present enquiry. The chapter titles in themselves indicate a quite different direction and emphasis in this document, especially when compared to the literacy policy documents scrutinised for the purposes of this analysis: "The emerging new paradigm for the education industry", "Work design, information technologies and professional development", "Strategies for access and equity", "New media, communication technology and education".

As outlined in the Executive Summary, intrinsic to the report is acknowledgment of the expansion of global communication networks, "the impact of “information superhighway” on our way of life" (Tinkler et al, 1996, p. ix). The first major point made is the need to "look beyond 'computer literacy' and consider the importance of ‘information literacy’ which takes into account the development of higher-order skills in processing information" (Tinkler et al, 1996, p. x). Stress is also placed on the importance of resource people to provide technical and human support "to deliver education", a perhaps problematical notion in itself. Other points refer to the importance of "leadership" in the successful application of new technologies to education, as well as to adequate and appropriate professional development. The problem of inbuilt obsolescence is considered; also considered is the central and increasingly important role of librarians and libraries. The document acknowledges the problem of policy being out of date by the time it is published. It also suggests that there is a need for technologising the curriculum to take into account all costs: infrastructure, hardware, software, upgrading, maintenance and technical support and professional development. Further, it proposes offering incentives to teachers to encourage them to use information technologies (Tinkler et al, 1996, p. xii).

The document discusses what it calls, “The new paradigm for the education industry”. Globalisation is intrinsic to this paradigm. It argues that education is being "transformed" (Tinkler et al, 1996, p. xiii) by three linked factors: globalisation and increased international competition for "market share"; changing market requirements for services and products with the move from the industrial economy to a knowledge economy; and the transformative impact of information technologies on the structure and organisation of the industry in responding to these imperatives. Schools are described as "evolving learning communities", built increasingly around networked links to homes, community learners, local businesses, and with university, TAFE and international links.

A key emphasis in the document is the notion of "information literacy", described as "a new form of literacy" directly associated with "the impact of convergent technologies on the way we learn, work and live", and defined as "the ability of students to use information and information technologies effectively to find, select and effectively use

information to create knowledge and insight" (Tinkler et al, 1996, p. xiii). Seven points follow on how this is to be achieved, ranging from the instrumental to the need for critical skills and the ability to transform information into knowledge for the purpose of learning. The document acknowledges distinctions between “information” and “knowledge” (Tinkler et al, 1996, p. xiv). Indeed, there is a strong emphasis on “learning”, conceived specifically within the frame of "market demand" and "the knowledge economy, and eight "principles" for the new learning are outlined: "lifelong", "learner-directed", "learning to learn", 'contextualised", "customised", "transformative", "collaborative/cooperative" and "just-in-time" learning (Tinkler et al, 1996, p. xiv).

With regard to professional development (Tinkler et al, 1996, p. xv), the document stresses the need for a strategy that "integrates individual initiative, system support and peer group training linked to the redesign of work and recruitment and promotion criteria with innovative uses of the new technologies" (Tinkler et al, 1996, p. xv). The challenge in schools is seen as the need to “integrate technology training with organisational reform and the move to a constructivist emphasis on learning” (Tinkler et al, 1996, p. xv). Furthermore, as schools become "more technologically intensive work environments", not only will they require "on-site technical support staff and access to high level networking support staff", but also an extension of "present trend towards team teaching" to include "technical and other support staff". Such teams will require on-site peer group training, online access to self training modules and technical support back-up, professional development courses, as well as postgraduate education programs in multimedia and other applications of technology and educational administration. Teachers generally "need to become more technologically literate, more aware of the non-neutral nature of technology, more skilled in the use of convergent systems and less inclined to be content with established educational practices" (Tinkler et al, 1996, p. xvi). The teacher is envisaged as moving from "expert information source" to "informational navigational guide, learning strategist, and knowledge analyst", as teaching moves from a didactic model to one based more on dialogue and co-learning (Tinkler et al, 1996, p. xvi). Teachers will therefore need to examine the relationship between new technologies and pedagogy, and be supported in professional development initiatives.

Three increasingly important problems associated with the growing use and convergence of the new technologies are identified: increased policy, management and operational dilemmas facing the sectors; the emergence of the home as a key site for the convergence of technologies, challenging the position of educational institutions; and the emergence of the “information poor” as a socially-disadvantaged group. New media forms and technological trends are pointed to, and their implications suggested for education and other institutions:

> With the rapid take-up of Internet activity, and the continuing rapid uptake and further evolution of the World Wide Web, with its graphic interface capabilities, a new space in human communication and expression is beginning to challenge our culture and institutions. (Tinkler et al, 1996, p. xix)

This is linked to the prospect of important changes to literacy practices:

> The impact of these developments on the way humans construct and use knowledge is still under debate, particularly the possibility that they will enable people, as learners, to move beyond the linear nature of print, with the reader as receiver of knowledge, to a non-linear electronic text that recovers the oral dimension of culture, allows multiple interactive authoring and involves high levels of visual literacy. (Tinkler et al, 1996, p. xix)

Particular emphasis is given to the challenges and changes in pedagogy promised by multimedia and its innovative creators. While the entertainment industry will drive much of this exploration, there is likely to be "a blurring of the boundaries between entertainment and education at the quality end of the product range as the insights of each inform the other" (Tinkler et al, 1996, p. xx). Finally, with regard to the enormous potential and challenge that new technocultural developments represent, specific implications are drawn for education, and (later) more specifically for literacy:

> To respond to this challenge the education sector must develop a new synthesis between core knowledge and media skills, and between appreciation of content, which generally increases with age, and comfort with the new media, which advantages youth. The new challenge to prepare people for a lifetime ofreskilling, redirection and reorganisation appears to present special difficulties for educators, who at this point in history are an aging workforce where the average age is generally over forty. If it is to properly service the changing needs of the workplace and society, education must see itself as being a new media industry. Educators must become as competent in the use and production of the new media as they have traditionally been in reading and writing. (Tinkler et al, 1996, p. 160)

The reports cited as providing background for this document are the Finn Review and the Mayer Report, various other reports on the use of technology and multimedia, and also the Candy Report (“Lifelong learning”) and the Smith Report from Victoria (“Technologies for Enhanced Learning”).

Within the context of a changing paradigm for education, the document addresses what it describes as "a generic competence required in the population—that of a new kind of information literacy", a synthesis of "elements of current initiatives to improve, through the education system, technology competence, information research skills and the development of higher order thinking skills in the population" (Tinkler et al, 1996, p. 73). In this regard, the Mayer key competencies are seen as a good start but there is a need to go further because of "the rapid movement towards ubiquitous electronic networking through convergent technologies, combining text, voice, image and kinaesthetics (simulations and virtual reality technologies) with interactivity that enables multiple authoring of communication" (Tinkler et al 1996: 73).

Further, the document argues that the knowledge economy demands "a competency that links information management skills, system thinking and learning skills and

information technology competency at various levels of sophistication". What is proposed, accordingly, is a new form of literacy—"information literacy":

> a literacy that combines information collection and analysis and management skills and systems thinking and meta-cognition skills with the ability to use information technology to express and enhance those skills. In a society of information “glut” the ability to detect “signal” from “noise” will become increasingly valued. (Tinkler et al, 1996, p. 74)

The document is emphatic in this regard:

> Students will require the development of information literacy to be effective citizens and workers in a knowledge economy, while teachers/learning facilitators will require this literacy to be able to develop it in their students and to carry out their professional responsibilities as knowledge workers. (Tinkler et al, 1996, p. 77)

This is seen in direct relation to new forms of learning, and more generally in a new emphasis on learning, with a concomitant implication for the notion of teaching and for teachers:

> In an information rich society, where learners can electronically access primary sources of information related to learning projects, teachers are no longer required to be the source of information . . . The teacher’s role shifts from an implicit command of learning strategies, through the way the information is organised in presentation, to an explicit command of learning strategies linked to the core competencies as they are applied to a variety of learning contexts. (Tinkler et al, 1996, p. 84)

The case is also made that the convergent technologies can support a shift in emphasis from teaching to learning. CD-ROMs can be genuinely "interrogative": "Interrogative products are multi-layered in construction and provide for multiple points of entry, which in turn allow the user to self-navigate within the data/information for the desired connected knowledge content" (Tinkler et al, 1996, p. 85). It is in this context that attention is given in the document to different types of learning, within a new knowledge-economy framework. It draws on insights, from commentators such as Peter Drucker, that in reshaping schools and challenging received forms of education, technology will be important primarily because it encourages and compels us to "do new things rather than enable us to do old things better" (Tinkler et al, 1996, p. 97)—a poignant evocation of the logic and rhetoric of “re-schooling”.

## State Policies

### NEW SOUTH WALES

In this section, the following policy statements are examined:

1. Board of Studies, NSW, (1994a). English K-6 Syllabus and Support Documents Nth Sydney: Board of Studies, NSW.

2. Department of School Education, NSW, (1994). Early Learning Profiles: English and Mathematics. Curriculum Directorate, Sydney: Department of School Education, NSW.

3. Department of School Education, NSW, , (1995c). Revised Early Learning Profiles: English and Mathematics. Curriculum Directorate. Sydney: Department of School Education, NSW.

4. Department of School Education, NSW, (1995b). Choosing literacy strategies That Work: Foundation Level—Level 2. Curriculum Directorate, Ryde: Department of School Education, NSW.

5. Department of School Education, NSW, (1997a). Choosing literacy strategies that work: *Stage 2.* Curriculum Directorate, Sydney: Department of School Education, NSW.

6. Department of Education, NSW, (1987). Writing K-12. Sydney: Department of Education, NSW.

7. Board of Secondary Education, NSW, (1987). Syllabus Years 7-10: English. Nth Sydney: Board of Secondary Education, NSW.

8. Board of Studies, NSW, (1992b). English Subject Outcomes. Sydney: Board of Studies, NSW

9. Board of Studies, NSW, (1996). DRAFT—Stage 6 English Syllabus: Preliminary Course (2 units and 3 units) and HSC Course (2 units, 3 units and 4 units). Nth Sydney: Board of Studies, NSW.

10. Department of Education, NSW, (1983). Computers in Schools: A General Policy Statement. NSW: Department of Education, NSW.

11. Department of Education, NSW, (1984). Computer awareness syllabus, Years 7-10 / Secondary schools. Secondary Schools Board, Sydney: Department of Education.

12. Department of Education, NSW, (1989). Using computers in primary schools. Computer Education Unit, Sydney: Department of Education.

13. Department of School Education, NSW, (1995d). TILT—Technology in Learning and Teaching: Principals' Briefing, Training and Development Directorate. Ryde, NSW: Department of School Education, NSW.

14. Board of Studies, NSW, (1994b). Stage 6 Syllabus: Design and technology 2/3 Unit. Nth Sydney: Board of Studies, NSW.

15. Board of Studies, NSW, (1991a). Design and technology Syllabus Years 7-10. Nth Sydney: Board of Studies, NSW.

16. Board of Studies, NSW, (1992a). Design and technology Years 7-10 teaching kit. Nth Sydney: Board of Studies, NSW.

17. Board of Studies, NSW, (1991b). Science and technology K-6: Syllabus and support documents. Sydney: Board of Studies, NSW.

## *The Analysis*

### *English and Literacy*

1. Board of Studies, NSW, (1994a). English K-6 Syllabus and Support Documents. Nth Sydney: Board of Studies, NSW.

The word “computer” did not appear in the Index of the NSW English K-6 Syllabus and Support Documents (Board of Studies, NSW, 1994a). Anyone searching for references to computers needed to turn to “Technology”, where they would have found computers included with "still cameras, video and audio systems, overhead projectors and facsimile machines" (Board of Studies, NSW, 1994a, p. 217). This section was included in the Support Document, "A Dictionary of Classroom Practices", which was a supplement to the syllabus, but included with it to provide guidance to teachers in its implementation.

Technology was seen here as relevant in assisting the language learning of students by providing them with ways of presenting and organising material and by representing alternative sources of information to print. However, there was also an explicit recognition that students needed to be assisted to understand and use the language of technology—in other words, the benefits for students in applying the technology increasingly accessible in modern classrooms was linked to the notion that technology constituted a site of special terminology and knowledge which should be made available to students within subject English.

In the Technology section, computers were presented as both enabling students to enhance the appearance and nature of texts, and also as constituting a field of knowledge and experience in their own right with references to font, print style, layout, databases, spreadsheets, electronic mailing systems and information technology, all of which students were expected to be able to use by the end of primary school. These directions went significantly beyond the “magic typewriter” approach to the relevance of computers in classrooms.

However, no justification beyond assisting students' language learning was given for the use of technology in this section; the idea that mastery of computers was necessary for coming to grips with the contemporary world was perhaps implied in the reference to the information accessible using technology, but not made explicit. English K-6 was the first NSW syllabus to adopt an outcomes-based approach, incorporating the National Profiles. Across the Strands of Talking and Listening, Reading and Writing, eighteen Outcomes, arranged in levels, provided the framework for teaching and learning in English. Two of these outcomes were relevant to computers.

The most obvious of these was Outcome 15b, "Word Processing". It took students from recognising "that texts can be produced using word processors" at Level 1 to using "most functions in word processing programs" at Level 5. Terms and concepts associated with word processing to be taught to students included: key, character, cursor, space bar, return key (Level 1); shift key, upper case, saving, printing (Level 2); font, file, save, retrieve, functions (Level 3); editing using cut, paste, copy and move functions (Level 4); and spell checker, thesaurus, graphics, change spacing and indenting (Level 5). Significantly, this outcome was among a number added to the syllabus by the NSW government in 1994, when it came to the view that the National Profile outcomes needed supplementing with others focused on specific basic skills, like spelling, handwriting and word recognition as well as word processing. This would seem to reflect the high priority placed by successive NSW governments on ensuring "computer literacy" for students.

Outcome 9 (a National Profile outcome) dealt with information collection and organisation and emphasised the use of a variety of sources. The Pointers for this outcome tended to privilege print materials but mentioned "databases [Press Com and Nexus], and CD-ROMs" at Level 4. This timing was supported in the English Learning Experiences section, which presented the content that teachers were expected to provide to ensure that students had opportunities to achieve the specified outcomes. Given the directions in the Support Document quoted earlier that the language of technology be understood by students, one would be justified in thinking that computers could make up more of the Pointers for an outcome which seemed to be directly relevant to them. Indeed, given that Outcome 15b was wholly devoted to word processing, it seemed logical that the other aspects of computing mentioned in the Support Document be targeted here more explicitly.

Overall, English K-6 recognised that computers should be part of the English curriculum, both as tools for producing and enhancing texts (the magic typewriter) and for finding information. The former role seemed to have a higher priority as the Pointers for Outcome 15b provided a sequenced program over the K-6 continuum of teaching for word processing, while the latter was scheduled for Stage 3, when students were more able readers and therefore more ready to use library and other research facilities. Computing was seen as having a language (and therefore a content) of which students needed to be aware, but this was recognised as being subordinate to student use of computer programs for their own language purposes.
It is worthwhile remembering the history of the English K-6 syllabus. This long-awaited document was heralded as reintroducing an emphasis on "basic skills",

particularly in the teaching of reading and grammar. It coincided also with the production of the National Profiles, a movement to outcomes-based criteria for assessing the progress of students and a political desire to measure such progress more publicly. Since its release, controversy has raged around both these elements—functional grammar and the syllabus outcomes have been the subjects of the Eltis Committee Report set up by the Labor government in 1995 (Department of School Education, NSW, 1995a). As a result, the syllabus is under review and will be replaced in 1998 by a document with different approaches to the functional view of language and outcomes. It seems unlikely, given the government's commitment to providing computers for schools and training for teachers that the new syllabus will see a substantially altered approach to computing.

The following four documents are now considered:

2. Department of School Education, NSW, (1994). Early Learning Profiles: English and Mathematics. Curriculum Directorate, Sydney: Department of School Education, NSW.

3. Department of School Education, NSW, , (1995c). Revised Early Learning Profiles: English and Mathematics. Curriculum Directorate. Sydney: Department of School Education, NSW.

4. Department of School Education, NSW, (1995b). Choosing Literacy Strategies That Work: Foundation Level—Level 2. Curriculum Directorate, Ryde: Department of School Education, NSW.

5. Department of School Education, NSW, (1997a). Choosing literacy strategies that work: *Stage 2.* Curriculum Directorate, Sydney: Department of School Education, NSW

The "Early Learning Profiles" (Department of School Education, NSW, 1994 & 1995c) and "Choosing Literacy Strategies That Work" (Department of School Education, NSW, 1995b) were produced to further support the syllabus. Both documents reinforced the syllabus' approach to computers. The "Early Learning Profiles" represented a recognition that students entering kindergarten possessed a wide range of abilities and there needed to be some pre-Level One outcomes to chart their progress realistically. Word processing was included among the pointers for Transition level (Department of School Education, NSW, 1995c), so that even for children in a pre-literacy stage of development, the computer was seen as providing both a useful tool in learning to write and a field of knowledge and experience.

"Choosing Literacy Strategies That Work" (Volume 1: Foundation—Level 2) was produced to give teachers support in linking each syllabus outcome to effective classroom teaching techniques. Apart from providing an exhaustive resource of proven strategies for enhancing student literacy, the document demonstrated the continuity of the syllabus with past practice and attempted to show how an outcomes approach could be used in conjunction with literacy programs. In relation to computing, the document outlined ways in which word processing, information gathering and software packages could be used to enhance student outcomes in

reading and writing. For Level One students, this included designing a procedural text, "How To Use The Computer", which could be used as a classroom chart (Department of School Education, NSW, 1995b, pp. 232-33). Again, as in the syllabus, it was recognised that to be able to use computers effectively students needed to learn about the computer, and further, that this knowledge and experience should begin in the very first years of schooling and should include all students.

It was interesting to note, however, that the subordination of computing to English was reflected in the absence of any direct reference to computers in the pages outlining the skills, knowledge and experiences students at each level were expected to have achieved. For Level Two Writing, for instance, students were expected to be able to spell, edit using reference sources, create brief texts, write legibly and in straight lines and plan and revise their writing. To facilitate these developments, the teacher's role included providing "a variety of media for students to use for writing and drawing" (Department of School Education, NSW, 1995b, p. 250). The use of computers is implied here, rather than directly stated.

In May, 1997, the second volume of *"Choosing literacy strategies that work"* for Years 3 and 4 students appeared. In the Reading Overview, students were to be provided with "opportunities to explore ways in which visual elements, such as diagrams, charts, picture books and film sequences, construct meaning . . . and experiment with ways that technology shapes media texts" (Department of School Education, NSW, 1997a, p. 87). In the Writing Overview, however, explicit mention of editing functions on word processors, exploring fonts and script styles and learning how to save and retrieve text was made (Department of School Education, NSW, 1997a, p. 183). These were expanded in the Strategies section where each of the above skills was placed in the context of different classroom learning experiences involved in the systematic and explicit teaching of writing. The organising structure of these experiences, Modelled, Joint/Collaborative and Independent writing strategies, was consistent with the method of teaching text types proposed in the English K-6 syllabus.

While predominantly concerned with the development of print literacy, the English syllabus and its support documents can be seen to have begun to take up the challenge of technology and to recognise that no contemporary version of literacy can be meaningful without reference to that challenge.

At the beginning of Term 4, 1997, a revised draft of the English K-6 syllabus was released to schools for consultation. In relation to technology, the only significant difference between the draft and the original syllabus was an expansion of the number of indicators for Outcome 12, specifically dedicated to Handwriting and Computing. For instance, in the 1994 document (Department of School Education, NSW, 1994, p. 348), four indicators for Level 4 (Years 5 and 6) were supplied in contrast with ten indicators for Stage 3 (Years 5 and 6) in the draft 1997 version (Department of School Education, NSW, 1997a, p.37).

The draft indicators were more specific and reflective of recent educational trends in the use of computers in schools. References were made to using software programs, varying size, style and font, contributing to web pages and importing graphics and

written texts for construction of student texts. Overall, the draft syllabus acknowledged a growing need for students to develop skills in producing texts, graphics and multimedia presentations. This would seem to indicate a significant step forward in thinking over the original syllabus.

6. Department of Education, NSW, (1987). Writing K-12. Sydney: Department of Education, NSW.

This document represented an attempt to place writing (and reading) in an across-curriculum context rather than as uniquely relevant to subject English. It laid down a process-writing model for teachers of both primary and secondary schools to follow, in an attempt to establish common principles and practices in all subject areas which could be manageably and successfully implemented. It was also quite explicit about the role of computers in the writing process.

Principle 11 in the Statement of Principles for Writing K-12 maintained the necessity for a wide range of writing tools to cater for the individual needs of students, to motivate reluctant writers, and to enable students to fully develop their writing abilities. Computers were presented as providing a number of different “tools”, such as word processing programs, electronic mail systems, networks and software. An important element of the role of the school in implementing the principles of Writing K-12 was that it provide appropriate hardware and software "in keeping with its resources and the school writing plan" (Department of Education, NSW, 1987, p. 47). The image of a "good writer" presented in the document included both the pen-wielder and the word-processor user, thus linking technology quite closely with literacy achievement across the subject disciplines. The variety of forms of writing expected to be taught to students included those which would obviously benefit from word-processing and printing like stories or essays, as well as databases and texts like brochures and posters for which graphics and layout concerns would need to be addressed. Indeed, the document presented "new technologies" as assisting in improving student writing because they lent themselves to the process approach, especially in the editing, conferencing and proofing stages.

Overall, Writing K-12 encouraged teachers to use technology to assist in developing and enhancing student writing at all opportunities, but assumed that teachers had the expertise to do so. The purpose of the document was to outline a state-wide writing policy and to provide support for its implementation by supplying practical KLA-based classroom suggestions. The role of computer technology was acknowledged, but no attempt was made to provide assistance for teachers in acquiring the knowledge and training necessary to enable their students to benefit fully from it. That was seen to be outside the document’s brief.

In the next section, the following two documents are examined:

7. Board of Secondary Education, NSW, (1987). Syllabus Years 7-10: English. Nth Sydney: Board of Secondary Education, NSW.

8. Board of Studies, NSW, (1992b). English Subject Outcomes. Sydney: Board of Studies, NSW.

A similar view applied to the “English Syllabus, Years 7-10” (Board of Secondary Education, NSW, 1987). It specified the study of Reading, Writing, Talking, Listening, Literature and Mass Media, but defined the latter as "films, television, video, radio and print" (Board of Secondary Education, NSW, 1987, p. 16), excluding computer-based electronic texts. This was rectified in “English Subject Outcomes, Years 7-12” (Board of Studies, NSW, 1992b), which was a supplement to the existing English secondary syllabuses. It included computer technology among the other sources of media products listed in the 7-10 syllabus. In the Stage 4 Skills Outcomes, for instance, it directed teachers to provide students with opportunities to "observe, listen to, and read print, electronic, and computer mass media products" (Board of Studies, NSW, 1992b, p. 21).

Both the 7-10 syllabus and the Outcomes documents reinforced the Writing K-12 message that the word processor had a useful role to play in the teaching of writing. The Syllabus maintained that word processing could facilitate drafting and revising as well as provide immediate "printouts" and endorsed the "speed and convenience of the computer" (Board of Secondary Education, NSW, 1987, p. 38). The Outcomes document went beyond this "magic typewriter" approach to include electronic texts among the range of mass media texts that students were to construct and dissect in Years 7-10, in recognition of the dramatic developments in computer technology in the five years since the Syllabus had been released. It also specified that students "should be able to predict how emerging technologies may change language use and ideologies" (Board of Studies, NSW, 1992b, p. 19), which acknowledged that computers were more than a tool assisting literacy, but also shaped and influenced literacy and language.

This recognition of the importance of technology extended into other areas besides mass media, where the expanded role of computers was, if not directly stated, then implied. For example, in the Reading Skills outcomes for Stage 4, students were to "use the strategies of reading and understand their purposes in relation to familiar text e.g., scanning, browsing, skimming" (Board of Studies, NSW, 1992b, p. 6). The final three terms are as relevant to computer-generated texts as to print. In the same section for Stage 5, students were to analyse and critically evaluate the effectiveness of "particular print styles, handwriting, layout, headings, sub-headings and illustrations" (Board of Studies, NSW, 1992b, p. 7), which again led into areas in which computers, as well as print, were relevant.

Thus, secondary English students in NSW from 1992 were expected to achieve outcomes which depended upon significant experience with computers, going beyond word processing to include an ever-expanding range of electronic technologies. The acquisition of the skills and knowledge required by teachers and students to do this

was seen as outside the areas covered by these three documents, but in mandating them as involved in the achievement of outcomes by students, the Board of Studies acknowledged the increased role of computer technology in English and writing.

9. Board of Studies, NSW, (1996). DRAFT—Stage 6 English Syllabus: Preliminary Course (2 units and 3 units) and HSC Course (2 units, 3 units and 4 units). Nth Sydney: Board of Studies, NSW.

In 1996, secondary English teachers in NSW were presented with a radically different draft HSC syllabus (Board of Studies, NSW, 1996). At the time of writing, January 1997, the consultation phase associated with the syllabus is still continuing and is likely to take a substantial amount of 1997 to complete. There is some likelihood that the current draft will be amended, though to what extent and in what form is difficult to predict.

The draft syllabus was explicitly based on a perceived need to "update" HSC English, both for theoretical and historical reasons as well as practical considerations to do with scaling and student choices of the less academically rigorous courses. As Paul Nay-Brock pointed out in 1987, the 2/3 Related and the 2 Unit General courses reflected the New Critical approaches of the 1940s and 1950s and were heavily based on the critiquing of literature, excluding study of things like film, media and student creation of texts. Consequently, the draft syllabus attempted to acknowledge the ways in which Subject English had been redefined since the 1960s, taking into account different theoretical perspectives ranging from feminism to post-colonialism, changes in approaches to texts, new technologies, and developments in linguistics and cultural studies. The creation of texts was given equal status with critiquing, a move that had some implications for the use of computers in senior English classrooms, not only in terms of word processing and presentation issues, but also in the creation and critiquing of electronic, multimedia texts.

The syllabus was organised into a Core and Electives structure, with the study of Electronic and Print Media making up a quarter of the electives offered. In the Year 12 elective in the Creating group, students were offered the opportunity to construct and study as models multimedia texts, with explicit reference to the World Wide Web and electronically generated texts. It was envisaged that students would create their own multimedia text after studying a selection of models and then proceed to construct their own, centred around a set text which was meant to provide a focus for research, imagination, and creation. Students with a special interest in this area could use it also as the basis of a Major Work in studying a fourth unit of English. For schools without the resources or expertise to offer the multimedia topic, an alternative within the elective of Constructing Media Documentary (radio or video) was also offered. However, with the NSW Government's policy of connecting all schools to the Internet, providing training to teachers in using computer technology and supplying all schools with sufficient computers, the potential for a large number of schools and teachers to offer the Constructing Multimedia Texts topic would seem to have been enhanced. The syllabus could be seen as directly linking the Government's policies to the curriculum and providing a basis for taking English into the next century.

Computer technology was also implicated as a source of texts and a research resource within the Factual Texts component of the Core, the three Factual Texts Electives offered over the two years of study and the Cultural and Linguistic Studies and Vocational Texts Electives in Year 12.

Thus, it would seem that the draft syllabus entails the absorption into the English curriculum of a variety of technologies which are excluded in the current courses. Some concern has already been expressed that the draft syllabus represents a watering down of literature and therefore a lowering of standards because of its pluralistic approach to English. It will be interesting to see how this conflict is resolved.

*Recent developments*

Since writing the above the NSW Department of School Education has launched its literacy strategy, the goals of which are that all young people should: be able to express themselves clearly and well in written English, and should enjoy doing so; read widely for both pleasure and instruction, with discernment and understanding; be articulate in conversation and in public speaking; be good listeners capable of comprehending and evaluating what they hear; and gain a growing appreciation of that part of our cultural heritage which is embodied in English, in preparation for future participation as literate adults in the cultural life of our nation (Department of School Education, NSW, 1997c, p. 3). It takes its definition of literacy from Australia's Language: The Australian Literacy and Language Policy (DEET, 1991a) which also recognises the importance of literacy skills for the achievement of social and economic goals. The strategy is supported by a range of curriculum documents, teacher training, promotion of home and school partnerships and the establishment of literacy support teams in schools and districts. In reading especially it draws on the work of Freebody and Luke (1990) using as a framework the four roles of the reader: code breaker; text participant, text user; and text analyser. Success of the strategy depends on explicit and systematic teaching of literacy through daily instruction and regular monitoring and feedback. Continuity of learning is to be achieved through a whole school approach. Regular assessment of literacy, supported by The Revised Early Learning Profiles in English and the ESL Scales is an integral part of the strategy.

In secondary schools teachers are being supported to develop students' skills in meeting the particular literacy demands of each subject area through the Teaching Literacy in . . . series and NPDP programs such as Making the Net Returns Worthwhile, New Technologies: New Literacies CD-ROM, and the Literacy for Learning, Years 5-8 CD-ROM.

## *Technology and Computing*

This section investigates five documents in two stages beginning with the following three documents:

10. Department of Education, NSW, (1983). Computers in Schools: A General Policy Statement. NSW: Department of Education, NSW.

11. Department of Education, NSW, (1984). Computer awareness syllabus, Years 7-10 / Secondary schools. Secondary Schools Board, Sydney: Department of Education.

12. Department of Education, NSW, (1989). Using computers in primary schools. Computer Education Unit, Sydney: Department of Education.

The first policy statements dealing with computers in NSW acknowledged that they represented increasingly significant "agents of change in society" (Department of Education, NSW, 1983, p. 2) and aimed at raising student awareness as an initial goal. The “Computer Awareness” Syllabus (Department of Education, NSW, 1984) was directed at students in Years 7-9, but was seen as a stopgap measure, necessary only until the basic concepts and skills associated with computing could be incorporated into the primary schools across the curriculum. The speed of technological change and the need to ensure the professional development of teachers before setting out guidelines for the implementation of computing into primary schools meant that it was not until 1989 that they actually appeared.

The “General Principles” section of the general policy statement saw computing as important both in the classroom, as an area of knowledge and as a teaching and learning tool, and also in the office, as an administrative aid assisting management. It stated that "learning about computers should be part of the school experience of all boys and girls and the professional development of all teachers" (Department of Education, NSW, 1984, p. 6). The purpose of such learning was to facilitate a basic understanding of the technological environment. Computers were seen as a teaching and learning aid, of which teachers would need to gain an understanding. Computers were also to assist schools in managing records, resources and information. Thus, computers were seen as permeating the school at all levels.

Under the heading of "Learning about Computers and Computing", minimum goals were set out for students to achieve before they left school. These included: an awareness of the social implications of computers; an experience of the use of computers as learning aids in a wide variety of areas; practical experience in using computer programs in problem-solving situations; and an awareness of the nature of a computer program. The major priority in these early years was to bring students up to speed, as quickly as possible, with the revolutionary impact of computer technology. The minimum goals reflected this desire to send students into the workforce with at least some “hands on” experience of computers so that they might be better able to cope with the extent to which computers would increasingly transform the workplace. The emphasis on students and teachers using technology for educational purposes, rather than being used and manipulated by it, was further reflected in the aim to the first syllabus produced to implement these principles (Department of Education, NSW, 1984), which was "to develop in students those understandings which give them a greater measure of control over their lives in relation to their changing technological environment, individually and collectively, now and in the future" (Department of Education, NSW, 1984, p. 4). Right from the beginning in NSW, students were seen

as needing both practical skills and knowledge in using computers and also an ability to see computers in terms of their impact on the wider social context.

“Using Computers in Primary Schools—Guidelines” (Department of Education, NSW 1989) began the second phase of introducing computers into NSW primary schools. It stipulated that computing was the responsibility of all teachers rather than specialists and should be present in all Key Learning Areas rather than in a specific course. Again, there was an emphasis on students gaining "control" over technology, on using computers to assist their own learning and solve educational problems. In the section entitled "Computer Education and Individual Development", computers were presented as providing opportunities for students to enhance their social skills and teamwork, thus avoiding the stereotype of the “computer nerd” and anti-social isolation. The philosophy behind this set of guidelines was that students were to be allowed to "learn about computers by USING computers for learning" (Department of Education, NSW, 1989, p. 4). Such learning was presented as a progress from lower order skills like recording data to higher order skills like interpreting data. Thus, the prime importance of computer education in primary schools lay in empowering children to learn about computers in the context of establishing the subordinate relationship of technology to human, educational purposes. Student attitudes to technology were seen to be just as important in computer education as acquiring the required skills and knowledge about computers—the key words were “confidence” and “control”.

Computers were depicted as valuable resources in providing: access to large amounts of information; opportunities for synthesising and presenting such information; software packages which allowed students to maximise the effectiveness of their own work, like word processors, or to experience simulations and problem-solving interactive scenarios; and the chance to communicate with students from other schools and countries. The guidelines were emphatic about all students experiencing computer education in all curriculum areas, thus reinforcing the seriousness with which it was viewed.

Both policy and guidelines were a result of the Computer Education Program of the mid 80s to early 90s. The work of the NSW Computer Education Unit and the regional consultants employed under that program provided assistance to teachers in an effort to provide more than “basic computer education” to students.

13. Department of School Education, NSW, (1995d). TILT—Technology in Learning and Teaching: Principals' Briefing, Training and Development Directorate. Ryde, NSW: Department of School Education, NSW.

Another thrust came in 1995, with the Labor Government's Computers in Schools policy (CISP) (ALP, 1995) which provided: access to the Internet for all schools; additional computers to schools; district technology advisers; and curriculum and training support for teachers. This could be seen as a more coordinated effort involving three of the major Directorates within the Department of School Education. The provision of hardware, training and curriculum support to improve the learning outcomes for all students in all key learning areas from Kindergarten to Year 12 recognises that computer-based technologies provide a significant educational

resource for achieving this aim. The policy is aimed at expanding access to new technologies such as "CD-ROM databases, on-line news and information services, multi-media technology and future technologies of which we can only speculate" (ALP, 1995, p. 7). The rationale for the training component of CISP, “Technology in Learning and Teaching” (TILT), privileges access to global information as "one of the most valuable skills we can teach" (Department of School Education, NSW, 1995d, p. 2).

One component of the six component (30 hour) TILT program is devoted to the Internet and email. It is supported by a curriculum document *connect.edu: Internet in teaching and learning*, distributed to all government schools. Further curriculum documents (one for each secondary learning area and an integrated primary document) have been distributed to all government schools. These provide activities to assist in the development of student ability to: use computer-based technologies to locate, access, evaluate, manipulate, create, store and retrieve information; express ideas and communicate with others using computer-based technologies; develop an awareness of the range of applications of computer-based technologies in society; discriminate in the choice and use of computer-based technologies for a given purpose; and develop the confidence to explore, adapt and shape technological understandings and skills to challenges now and in the future (Department of School Education, 1997b). As with the primary Guidelines all students are included in CISP with specific attention being paid to Special Education.

The TILT course itself has been designed for teachers "who are not currently using technology in the classroom" (Department of School Education, NSW, 1995d, p. 14) and focuses on practical, “hands-on” workshops ranging from classroom applications of technology to available software to the Internet. The Principals’ Briefing dealt with the resources that would be provided for schools and was not meant to be a syllabus document, outlining curriculum goals. Nevertheless, it presented technology as a major priority of the government and as the focus of very substantial financial and training investment (see further discussion of TILT in *Some options in professional development*, Volume 3 of this report).

14. Board of Studies, NSW, (1994b). Stage 6 Syllabus: Design & Technology 2/3 Unit. Nth Sydney: Board of Studies, NSW.

In 1995, 4536 students sat for the HSC in Design and Technology at 2/3 (Common) level and 448 at the 3 Unit additional course, making it the second most popular Technology and Applied Studies course after Computing. Though no prerequisite study was required, the Stage 6 syllabus was consistent with both the philosophy and structure of the Years 7-10 syllabus, in that it emphasised the purpose of technology as the improvement of the quality of human life, the necessity for human knowledge and control of technology, and the role of technology in shaping and changing culture, societies, environments and economies. The Syllabus accepted the challenge of preparing students "to be the designers and technologists of the twenty-first century" (Board of Studies, NSW, 1994b, p. 8), and in the Rationale for the 3 Unit course explicitly linked itself to "providing new and different pathways to careers in fields such as design, architecture, food technology, engineering, town planning and medicine" (Board of Studies, NSW, 1994b, p. 8).

As with the 7-10 Syllabus, students were to encounter technology in the context of practical experiences. Thus, no prescribed content was laid down, but rather students in the 2 Unit Common course would carry out Design Projects, Comparative Case Studies of two organisations and a Major Design Project in the course of which all facets of the design, production, marketing and evaluation process would be implemented and studied. Indeed, the Major Design Project was to represent 60 per cent of the total marks available in the HSC examination.

In the “Introduction to the Syllabus”, computers were singled out as providing "not only a technology for study in its own right but also a tool which can support learning and should be incorporated into 2/3 Unit (Common) and 3 Unit (Additional) courses where appropriate" (Board of Studies, NSW, 1994b, p. 6). In the “Objectives and Outcomes” section, opportunities for the use of computers were entailed in the majority of the Knowledge, Skills and Attitudes components. These included use in enhancing communication and presentation, study of the history of technological innovations, employment as a design and/or production tool to use in conjunction with other technologies, and the creation of computer products, systems and environments.

The Syllabus defined technology very broadly to cater for both rural and urban communities and, in placing an emphasis on practical experience and creation, accented the integration of technologies for a wide range of purposes. Perhaps too because of the existence of Computing Studies courses, this Syllabus needed to avoid too obvious a dependence on computer technology at the expense of other forms. This would explain the lack of explicit references to computers in the “Outcomes” sections of the Syllabus. However, the use of computer technology was implied throughout this section and in all outcome categories. Thus, in the Knowledge outcomes, students were expected to be able to "explain the effect of technological change on lifestyle, culture and the workplace" (Board of Studies, NSW, 1994b, p. 12) and to "describe techniques for researching, recording and presenting information" (Board of Studies, NSW, 1994b, p. 13); in the “Skills” section, they had to be able to "experiment with materials, tools and techniques, when designing" (Board of Studies, NSW, 1994b, p. I6) and to "demonstrate proficiency in using a range of resources, practical skills and processes" (Board of Studies, NSW, 1994b, p. 16); and in the Attitudes section, to "display confidence in the use of technologies" (Board of Studies, NSW, 1994b, p. 20) and to "appreciate the capacity of design and technology to influence, shape and change society, the quality of life and the environment" (Board of Studies, NSW, 1994b, p. 19). These examples were typical of many others in this part of the Syllabus, and were consistent with the syllabus view that computers were part of the design and production process and could therefore be integrated into any area or project. No specific computer applications were mentioned, but the role of word processing, graphics, communication technology, systems creation and applications were strongly implied throughout the “Outcomes” sections for both the 2 and 3 Unit courses.

Thus, schools and teachers of Design and Technology in Stage 6, as in Stages 4 and 5, were expected to make choices of the most appropriate technologies for the design projects they were pursuing and it was clear from the outcomes that there was substantial room for the involvement of computer technology. Students were expected to use appropriate tools in creating design projects and teachers were

expected to select, demonstrate and instruct students in the use of such tools—computers were presented as important examples of such tools for use in achieving a variety of purposes and as capable of being integrated with other technologies in the achievement of successful projects.

The following two documents are now considered:

15. Board of Studies, NSW, (1991a). Design and technology Syllabus Yrs 7-10. Nth Sydney: Board of Studies, NSW.

16. Board of Studies, NSW, (1992a). Design and technology years 7-10 teaching kit. Nth Sydney: Board of Studies, NSW.

Design and Technology (7-10) was introduced in 1991 as a mandatory 200 hour course with an additional optional elective. The two courses were closely related with the elective being a more sophisticated version of the mandatory course and most schools chose to timetable the latter in Years 7 and 8 and the former in Years 9 and 10. The mandatory course was represented as "the foundation course for the Technological and Applied Studies Key Learning Area" (Board of Studies, NSW, 1991a, p. 1) and reflected the recognition that "an across curriculum approach for design and technology was not sufficient" (Board of Studies, NSW, 1991a, p. 1) to guarantee that all students would experience or learn to control a range of technologies.

Curriculum change in NSW during this period (known as the Metherell era) was based on “Excellence and Equity”, a document that set out very clear requirements for schools in relation to a core curriculum and indicative times to be devoted to it. In being accorded 200 hours and mandatory status, Technology was given equal prestige with Australian History and Australian Geography. Schools were required to provide a foundation curriculum in all the Key Learning Areas. “Excellence and Equity” represented the Coalition State Government’s attempt to lay down a guaranteed curriculum in response to what it saw as the proliferation of courses of dubious rigour which had been allowed to develop under the previous Labor administration. Design and Technology was meant to enable existing Applied Science (Industrial Arts, Agriculture and Home Science) subjects to be updated and integrated with computing and other contemporary technologies.

Within the syllabus, computing was seen as something of a special case, being specifically allocated at least 50 of the available 200 hours of the mandatory course. This could be covered by integrating it into various Design Projects, six of which had to be covered in the compulsory course and four in the elective. The Prescribed Contexts from which the Projects had to be drawn included: Agriculture; The Built Environment; Clothing and Accessories; Engineered Systems; Food; Health and Welfare; Information and Communication; Leisure and Lifestyle; Manufacturing; and Transport and Distribution. Each Design Project had to follow a Design Process made up of Designing, Making, Evaluating, Communicating, Marketing and Managing, and it was easy to see how computing could fit into any phase of this process according to the particular demands of the project. The Syllabus also allowed for computing to be a specific feature of study in the Information and Communication Prescribed Context.

Schools were thus given considerable flexibility in fulfilling the 50 hour requirement in relation to computing.

In terms of the aims of the syllabus concerning computing, students were expected "irrespective of prior experience" to develop "basic operational skills and an awareness of computer applications in society" (Board of Studies, NSW, 1991a, p. 20). Thus, students were seen as learning how to use computers in a purely operational sense as well as about computers, including a critical awareness of their role in enhancing the "quality of life" within society. Students here were not to be merely acquiescent users of technology but were to take part in an evaluation of "the moral and cultural implications of using technology in society" (Board of Studies, NSW, 1991a, p. 8). Safety and sustainability were also consistently emphasised throughout the Syllabus.

The Support Document (Board of Studies, NSW, 1992a) outlined specific areas of computing which might be used in the creation of Design Projects: Word Processing and Desktop Publishing; Databases; Spreadsheets; Telecommunications; Computer Graphics; Control Systems; and Simulations. It provided suggestions as to how these areas could be integrated into each of the Prescribed Contexts. However, no sequenced program of teaching these areas was specified to ensure that all students possessed "basic operational skills". Rather, it was left to the teacher or team of teachers to devise a set of projects in relation to the needs of their students and the available resources in the school and community. Students would thus learn to use and evaluate technology in the practical context of design and manufacture. Computing, while specified as important in its own right as a field of knowledge and skills, could be handled as a tool in the design and production process. Technology was linked to a practical end and was therefore seen as serving human and social interests and purposes which required constant informed evaluation of its effects on the environment and community. It was not something to be dominated by or afraid of, but rather demystified by the context of design in which it was to be judged and by its effectiveness and use in the process of designing and creating specific products.

“Design and Technology (7-10)” (Board of Studies, NSW, 1991a) did not supply a curriculum for the teaching of computer technology, but rather attempted to provide a practical context in which students could use computers to design and produce specific projects in a variety of fields from agriculture to leisure. Students were expected to develop "basic operational skill" in a minimum of 50 hours spent using computers, but no attempt was made to specify what these basic skills were nor a sequence in which they were to be taught. This was consistent with a syllabus which dealt primarily with the design process in a wide variety of areas. Technology was presented in its human, industrial and social context—students were to be involved in designing products, making them and marketing them, and the use of technology was subordinate both to that process and also to moral, environmental and cultural perspectives. It could be argued that “Design and Technology (7-10)” (Board of Studies, NSW, 1991a) presents technology in a balanced fashion, as tool, knowledge object and subject of human evaluation like any other subject, rather than as awe-inspiring or frightening.

17. Board of Studies, NSW, (1991b). Science and technology K-6: Syllabus and support documents. Sydney: Board of Studies, NSW.

In “Science and Technology K-6: Syllabus and Support Document” (Board of Studies, NSW, 1991b) technology was broadly defined as "concerned with the purposeful and creative use of resources in an effort to meet perceived needs or goals" (Board of Studies, NSW, 1991b, p. 1) and computers were presented as a special type of resource which had gained such status by virtue of their modernity and pervasiveness. The Syllabus specifically singled out computer technology in its “Introduction” as influencing "almost every facet of our lives" and as being "some of the most significant causes of change for people in the latter half of the twentieth century" (Board of Studies, NSW, 1991b, p. 2). It therefore immediately established three related needs which were to be seen as important priorities for students: "to understand computers by using them", "to understand the nature of communication technology and to become competent mass media users" (Board of Studies, NSW, 1991b, p. 2). Thus, computer education was at once privileged in the Syllabus, and a strong message sent to teachers and schools that they had to accept substantial responsibility in this area.

The content strands of the Syllabus were: Built Environments; Information and Communication; Living Things; Physical Phenomena; Products and Services; and The Earth and its Surroundings. The outcomes specified for Information and Communication targeted computers, especially in Stage 2, as storers and processors of information, and in Stage 3 in the use of graphics, sounds and communication technology, like email. Thus, it would seem that by the end of Year 6 students were expected to be conversant with databases, spreadsheets, software packages, word processing and electronic communication. The use of computer software was also implied in the other content strands, particularly as a source of information concerning things like “living things” or “the earth and its surroundings”.

In the “Learning Processes” section of the Syllabus, the use of computer technology was also heavily implied in the Investigating and the Designing and Making and the Use of Technology areas as both sources of information and a tool for practical use in achieving specific projects. Indeed, the emphasis on learning about technology in the context of using it to design and create products rather than learning about it in isolation from the realm of the practical was justified both on educational grounds (learners learn best when practically involved in the achievement of real purposes) and on technological grounds ("specific technological knowledge and skills are becoming redundant in increasingly shorter periods of time") (Board of Studies, NSW, 1991b, p. 24). This view of technology education was equally present in the secondary syllabuses for Design and Technology, privileging the design-production-evaluation process over instruction in particular aspects of specific technologies which were liable to speedy obsolescence.

The Syllabus was accompanied by a Support Document which contained sample units of work which could be adapted by teachers according to the particular needs of their students. Computers made up a substantial part of these units. For example, in the “Let's Communicate” unit for Stage 1, the suggested resources included kits from the Computer Education Unit, software packages such as Playroom, Monsters and Make

Believe, Face Maker, and The Print Shop, and communications software such as e-mail and Keylink. One of the suggested units involved using graphics to design and make masks using some of the software packages listed above. Most of the other topics in the Support Document contained some activities which involved computer use, ranging across the full gamut of applications implied and/or specified in the Outcomes section of the Syllabus. Thus, it would have been very difficult to come away from reading this Syllabus without a clear sense of the imperative given to the use of computers in more than just a word processing capacity.

The Syllabus made the assumption that teachers would keep abreast of computer technology and ways of using it in the classroom. It was not seen as valid to stipulate too explicitly the areas of computing that needed to be taught to students because of the rate of technological advances, thus allowing for a state of continual adaptation by teachers, thereby ensuring the continued relevance of the Syllabus. The provision of units of work gave teachers concrete ideas on how to implement the Syllabus, but the plethora of suggestions allowed for a number of ways of achieving its objectives and outcomes. Obviously, the insistence on knowledge of computer technology and applications contained in the Introduction to the Syllabus had to be tempered by the availability of resources and expertise within schools. The Carr Government's policy of providing computers and training for teachers began in 1996 and is set to continue over the next two years, thus providing practical assistance in making the aspirations of this Syllabus and its secondary counterparts realisable.

## *QUEENSLAND*

In this section, the following policy statements are examined:

1. Department of Education, Queensland, (1994a). Principles of effective learning and teaching. Brisbane: Studies Directorate, Department of Education, Queensland.

2. Department of Education, Queensland, (1994b). English in Years 1 to 10 Queensland syllabus materials: English syllabus for Years 1 to 10. Brisbane: Department of Education, Queensland.

3. Department of Education, Queensland, (1994c). Shaping the Future: Review of the Queensland school curriculum (The Wiltshire Report). 3 volumes. Brisbane: State of Queensland Government Printer.

4. Department of Education, Queensland, (1994d). Shaping the future: Summary of recommendations. Brisbane: Department of Education, Queensland.

5. Department of Education, Queensland, (1995a). The computers in learning policy. Brisbane: Department of Education, Queensland.

6. Department of Education, Queensland, (1995b). Guidelines for the use of computers in learning. Brisbane: Department of Education, Queensland.

7. Education Queensland, (1997). Schooling 2001: School kit 1997-1998. Brisbane: Education Queensland.

8. Cosgrove, M., (1994). Technology and applied science curriculum. In Department of Education, Queensland, (1994c). Shaping the future: Review of the Queensland school curriculum (The Wiltshire Report). 3 volumes. Brisbane: State of Queensland Government Printer.

9. Taylor, A., (1994). Technology education. In Department of Education, Queensland, (1994c). Shaping the future: Review of the Queensland school curriculum (The Wiltshire Report). 3 volumes. Brisbane: State of Queensland Government Printer.

10. Department of Education, Queensland (1995c). Technology in Queensland Schools—A framework for discussion. Brisbane: Department of Education, Queensland.

## *The Analysis*

### *Learning*

In Queensland, all policies pertaining to specific aspects and areas of curriculum and pedagogy are overlaid by five general principles of Effective Learning and Teaching (hereafter, the ELT Principles). These comprise a corporate value, or *ethos*, intended to guide policy and practice alike, in all areas of a school's curricular work.

1. Department of Education, Queensland, (1994a). Principles of Effective Learning and Teaching. Brisbane: Studies Directorate, Department of Education, Queensland.

*Principles of Effective Learning and Teaching* was produced by the Queensland Department's Studies Directorate, and published in 1994 in conjunction with the 1994-98 Corporate Plan. It is a succinct nine-page document which impacts on teachers from the outset of their careers. For example, student teachers are expected to frame their cases for rating interviews around the ELT principles. The document is set out in five accessible sections. The Introduction relates the principles to the department's corporate ethos, explaining why the principles are expected to "underpin learning and teaching practices across all sectors of schooling." (Department of Education, Queensland, 1994a, p. 1). The five principles are identified in the second section and recapitulated as a set of clear directives. The third section identifies the main assumptions underlying the principles. Definitions of "learner", "teacher", "learning", and "teaching" emerging from the assumptions are provided in the fourth section. Finally, each principle is elaborated by way of 10 or so dot points which operationalise the principles as indicators of their implementation.

The five ELT principles are:

i. effective learning and teaching is founded on an understanding of the learner;
ii. effective learning and teaching requires active construction of meaning;

iii. effective learning and teaching enhances and is enhanced by a supportive and challenging environment;
iv. effective learning and teaching is enhanced through worthwhile learning partnerships;
v. effective learning and teaching shapes and responds to social and cultural contexts (Department of Education, Queensland, 1994a, p. 1).

Six main assumptions are identified as underlying these principles: (i) every person is a learner; (ii) the learning process is ongoing and lifelong; (iii) people learn within social and cultural contexts, both independently and through interaction with others; (iv) what is learned depends on how and with whom it is learned; (v) key elements making for effective teaching include identifying how others learn best, extending their ways of learning, creating opportunities for learning, and evaluating outcomes of learning; (vi) collectively, the ELT principles provide the basis for continuing enhancement of learning and teaching practices. These assumptions support expansive and reciprocal-democratic conceptions of "learner", "teacher", "learning", and "teaching":

i. learning involves making meaning out of experience;
ii. teaching is about guiding and facilitating this making of meaning out of experience;
iii. learners include all who are involved in the transactions around which learning occurs, since it is not pupils alone who learn in the processes involved;
iv. teachers include students, parents, caregivers, other community members, etc., as well as the professional teacher.

The overall tone of the policy can be captured by a typical sample of elaborations provided for each principle. For example, "understanding the learner" is seen to involve "taking into account relevance and meaning for the learner", and recognising factors such as location, gender, ethnicity, (dis)ability, and socio-economic circumstances that situate learners differentially within learning contexts. Learners are seen to "construct meaning" when they participate in a variety of formal and informal social and cultural interactions, explore and develop an openness to the diversity of knowledge, values and beliefs, reflect critically on knowledge, actions and assumptions, and develop a range (divergent, convergent, lateral, critical, creative) of thinking processes. Providing "supportive challenging environments" requires teachers to promote effective communication among all learners, equitable access to and flexible use of quality human and material resources, and diverse relevant experiences drawing on the school and the wider community as learning contexts. Establishing "worthwhile learning partnerships" involves learners and teachers taking time to reflect creatively and critically on their practices, and sharing in planning, learning and assessment.

The ELT principles can be seen as responses to important features of "new times" and well established educational values from the past, as well as to leading edge developments on educational theory and research informed by current positions from constructivist theory, social cognition, cognitive science, and theories of inclusivity.
They reflect the "new times" emphasis on learning, rather than teaching, which accords with trends toward greater self-sufficiency and independence as the

elaborate support mechanisms of the welfare state are pared back, and with conditions of the information age—where the short shelf life of knowledge undermines teacher-directed, content-filled education. The expectation that change is now the rule rather than the exception puts a premium on learning how to contribute and respond to change. Creativity, imagination, and self-reliance are important qualities in more entrepreneurial times. Capacities for critical thinking, problem-solving, innovation and flexibility are all regarded as basics of modern work, where continuous improvement, collaboration and teamwork, and accountability for quality are the order of the day. The principles also reflect the current trend toward decentralised and outcomes driven approaches to education. Teachers have to produce customised, responsive, and adaptable programs on the basis of principles and outcomes, rather than working from "one size fits all" and "off-the-shelf" logics more prevalent in the past.

At the same time, the principles reflect established educational values like inclusiveness, social justice, equality of opportunity, the importance of continuity of experience, holistic development of learners, community involvement, civic capacity and commitment, and a knowledge of past and present and how they are related. In terms of leading edge theory and research values, the ELT principles highlight meta-level understandings, communities of practice, and a renewed emphasis on thinking. The principles also resonate with a central construct in this study: namely, the necessity to engage in balanced measure the operational, cultural, and critical dimensions of social practice, as an integral feature of *educational* activity.

It is important, however, to acknowledge factors that may impede implementation of such principles, and that need to be addressed if they are to be realised in practice. These include teachers' knowledge bases and levels of professional development, availability of technical support systems, levels of resourcing, and contingencies related to organisational and cultural features of school contexts.

The emergence of new technologies is commonly recognised as opening a space where many young learners hold an advantage over teachers. To this extent it represents a possibility for teachers genuinely to engage as learners in the presence of technologically adept and confident youngsters. This, however, may challenge teachers who are more comfortable with teacher-directed pedagogies, especially if they work in schools steeped in more "traditional" modes. Teachers who are not well versed in new technologies need to feel confident and secure in their professional craft and expertise if they are to integrate new technologies into classroom learning, and thereby turn their relative inexperience with these technologies into a potential pedagogical strength. Regardless of their levels of personal and professional security, however, teachers are less likely to embrace new technologies enthusiastically if there is inadequate technical support and expertise to hand for troubleshooting "crashed machines", failed Internet connections, or faulty configurations. With intensified demands on teachers' time, and increased demands for accountability, only so much "down time" can be afforded for equipment lapses and lack of technical expertise. Moreover, considerable professional knowledge is needed if teachers are to integrate new technologies into pedagogy in ways that add educational value, as opposed to reducing them to mere add-ons. Furthermore, teachers quite reasonably feel demeaned when the resources schools have to offer

and the ends to which they are turned in classrooms are inferior to those learners can experience in other settings. Hence, the ELT principles direct us to consider seriously the prerequisites for realising them in practice at the meeting points of literacy and technology.

## *English and Literacy*

2. Department of Education, Queensland, (1994b). English in Years 1 to 10 Queensland Syllabus. Brisbane: Department of Education, Queensland.

The *English in Years 1 to 10 Queensland Syllabus* was published and introduced into schools in 1994. In recent years numerous policies and programs, such as the Year 2 Net (Department of Education, Queensland, 1995d) and the Literacy and Numeracy Strategy (Department of Education, Queensland, 1994e), have been introduced to enhance the learning and teaching of literacy at different school levels. The *Syllabus*, however, remains the central policy document in Queensland. Its goal is:

> to develop and refine students' ability to compose and comprehend spoken and written English—fluently, appropriately, effectively and critically—for a wide range of social purposes. (Department of Education, Queensland, 1994b, p. 26)

Syllabus implementation was supported by a systematic inservice program using the draft Syllabus materials—*Draft Years 1 to 10 English Language Arts In-Service Materials*. Inservicing was undertaken and completed prior to the publication and distribution of the new Syllabus, and no further professional development for its specific uptake has occurred. In 1995, schools were required to develop English programs using guidelines provided in the Syllabus materials (Department of Education, Queensland, 1994b). Many education advisers were encouraged to support teachers in developing unit plans using the guidelines.

The Syllabus draws explicitly on five theoretical "approaches" to language and literacy curriculum (Department of Education, Queensland, 1994b, pp. 1-2). These are described as "cultural heritage", "skills", "growth, developmental, process and whole language", "functional linguistic and genre-based", and "critical literacy" approaches. The hybrid "package" of approaches reflects the wide-ranging debate among literacy professionals and academics during the 12 year period from 1982, when syllabus development began, to 1994. The syllabus which eventually emerged attempted to integrate all the main theories involved in the debate rather than aligning with a specific approach. It supports in both explicit and implicit ways approaches to literacy learning and teaching consistent with a sociocultural perspective on language and literacy, as outlined in Chapter 5. In particular, the functional linguistics, critical literacy, and whole language components embody a sociocultural perspective.

A distinctive feature of the Syllabus is its use of the "Context-Text model" to underpin its account of language use. The "context" component refers to social and cultural contexts of language use, with "genre" being a key construct. "People . . . need to have explicit knowledge about the genres that are commonly used by cultural groups

within their societies" (Department of Education, Queensland, 1994b, pp. 4-5). Successful language use is construed in terms of making appropriate language choices which, necessarily, vary from context to context. Language choices are affected by three factors: subject matter ("field"), roles and relationships ("tenor"), and mode and medium ("mode"). The "text" component of the model conveys the idea that "meaning is realised through text of five kinds: spoken, written, nonverbal, visual, and auditory" (Department of Education, Queensland, 1994b, p. 9).

Very little explicit reference is made in the Syllabus to new technologies or, indeed, to distinctive literacies associated with new technologies. The Syllabus does, however, implicitly support and encourage teaching and learning such literacies through its emphasis on the context-text model. One of the few explicit references to new technologies in the syllabus materials occurs in relation to description of texts and meaning making. "Interactive multimedia technology allows access to combinations of media, thus making available simultaneously written texts, graphics, and video and auditory texts. Users are able to make choices about altering the medium. It is also possible to choose the extent to which available information is accessed" (Department of Education, Queensland, 1994b, p. 11).

The relative absence of references to new technologies and the kind of references that *are* made intimates a wider syndrome addressed in our conceptual and theoretical framework: namely, that "literacy" tends to be translated very often in *literary* terms rather than in social terms. Literacy is first and foremost a social concept. There has been, however, a common tendency for literacy theory and research to be picked up by English language professionals, constraining its theoretical and applied development to the old language and literature paradigm (cf. university Schools of Language and Literature renamed as Schools of Language and Literacy Education). In the Information Age it is absolutely crucial that the institutional renaming comes to reflect a substantial change rather than merely a change in terminology. This process has begun but, as reflected in the Syllabus, it still has a long way to go. The danger is that the interface between new technologies and literacy will remain constrained by characteristically *literary* perspectives, which will limit its educational scope and play into the hands of further "doing business as usual" (or, "doing school").

It must, nonetheless, be noted that the context-text model does make available to teachers ways of understanding language use that is mediated by new technologies. For example, emailing might be described as an identifiable genre by features that distinguish emailing from other genres (cf. Department of Education, Queensland, 1994b, p. 4). The ways emailing as a genre is practised varies "from one social context to another" (Department of Education, Queensland, 1994b, p. 7), as in, for example, the different characteristics of email communications between friends, members of discussion lists, and professional colleagues. The particular textual features of emailing "which work together to make meaning" (Department of Education, Queensland, 1994b, p. 10) can be identified and distinguished, notably in comparison with the more traditional genre of letter writing.

Similarly, and of importance for this study, the context-text model also offers teachers ways to think in operational, cultural, and critical terms about language and literacy learning. The Syllabus provides support for teachers to develop activities within and across each of these dimensions—although use of the Syllabus to date has tended to be defined, encouraged, and developed in mainly operational terms.

Policy development in Queensland bearing on the literacy-technology interface has typically reflected the conception of technology as tool. References to technology as tool within the English syllabus are mainly limited to keyboarding skills (Department of Education, Queensland, 1994b, p. 34) and descriptions of "technological aids". A further characteristic of policy development in Queensland is that it reflects difficulties associated with integrating curriculum areas and integrating literacy and technology/technological practices. Significant curriculum development initiatives have occurred within English, Technology, and Learning Technology. But each area seems to have its own experts, theoretical approach, and political agenda. Little attention is paid in one area to parallel issues and aspirations in others. In the English syllabus little mention is made of technology, and in the Learning Technology (Computing in Schools) policy only cursory attention is given to curriculum issues across the key learning areas.

The following two documents are now examined:

3. Department of Education, Queensland, (1994c). Shaping the future: Review of the Queensland school curriculum (The Wiltshire Report). Brisbane: State of Queensland Government Printer.

4. Department of Education, Queensland, (1994d). Shaping the Future:Summary of recommendations. Brisbane: Department of Education,Queensland.

In 1993, a committee chaired by Professor Ken Wiltshire reviewed the Queensland school curriculum. The Committee's report, *Shaping the Future*, appeared in March 1994 (Department of Education, Queensland, 1994c), with the Department of Education, Queensland, subsequently publishing a nine-page summary of recommendations (Department of Education, Queensland, 1994d). The committee reviewed curriculum in general. It recommended establishing a core curriculum covered the eight Key Learning areas, revamping the upper secondary school curriculum, and creating new structures to oversee curriculum development and implementation. Within the overall curriculum focus, policy recommendations, with a strong "back to the basics" flavour, were strongly emphasised. This accorded with the (then) Premier's 1992 election policy speech, which called for a curriculum "which ensures that the basics—including fundamental literacy and numeracy skills—are the driving force of curriculum in Queensland while, at the same time, maintaining sufficient flexibility within the curriculum for other specialist skill requirements" (cited in Department of Education, Queensland, 1994c, p. 3). Cabinet promptly approved procedures for syllabus and sourcebook development in all KLAs, including Technology—which was a component of the Years 1-8 core curriculum, though not a mandatory subject beyond Year 8. Apart from the possibility of providing computer software programs for pilot projects on extension work for gifted and talented students, the recommendations made no specific reference to new technologies.

Inter-systemic (state and non state sectors) curriculum development was recommended.

Literacy initiatives had a strong "foundations" and "skill improvement" emphasis. Additional funding was to be provided for new literacy initiatives, targeting, in particular, students and schools with the greatest need. Five main initiatives were identified for implementation in the published summary of recommendations:

i. a Year 2 diagnostic "net", to act as a screening device identifying learners with inadequate literacy (and numeracy) skills, factors impeding these learners' development, and solutions to be enacted. Parents would receive formal reports on their children's literacy proficiencies during Year 2;
ii. a Year 6 test of literacy and numeracy, serving accountability, quality assurance, and informational purposes—including identifying students in need of further literacy assistance;
iii. maintaining running records to monitor literacy progress during the early years;
iv. provision of specialist staff to support teachers in meeting Year 2 "net" and Year 6 test requirements;
v. pilot projects to trial strategies for assisting lower and middle secondary school learners experiencing literacy difficulties. (Cf. Department of Education, Queensland, 1994d, p. 7).

Policy initiatives have subsequently increased the profile of literacy intervention programs like Reading Recovery and Support-a-Reader. Perhaps the most noteworthy features of these literacy recommendations and subsequent initiatives are:

- the invisible place they give to new technologies;
- the lack of emphasis they give to what we call the "cultural" and "critical" dimensions of literacy;
- their consequent tension with the sociocultural perspective on literacy inherent in the Queensland P-10 English syllabus;
- and the fact that the "back to basics" ethos runs against the tide of educational reform in countries like the US, where "excellence" has displaced "basics" in the quest to diffuse "higher order" skills of problem-solving and critique as widely as possible among learners. The reform agenda emphasises capacities for self-generated innovation, flexible adaptability, continuous improvement, and application of principles seen as crucial for competitive advantage and active participation in social change.

## *Technology and Computing*

This section begins with the following two documents:

5. Department of Education, Queensland, (1995a). The computers in learning policy. Brisbane: Department of Education.

6. Department of Education, Queensland, (1995b). Guidelines for the use of computers in learning. Brisbane: Department of Education.

The *Computers in Learning Policy* (Department of Education, Queensland, 1995a) and its accompanying *Guidelines for the Use of Computers in Learning* (Department of Education, Queensland, 1995b) were published in 1995. The four-page policy document defines learning technology and establishes departmental priorities. "Learning technology is concerned with the use of computers and related technologies in learning. This focus addresses the educational implications of computers to enhance and extend learning and teaching" (Department of Education, Queensland 1995a, p. 3). Policy priorities are:

i. students will use computers to attain curriculum goals;
ii. students will develop skills and competencies in using computers and an understanding of the role of computers in society;
iii. teachers will acquire skills and competencies in the use and application of computers. (See Department of Education, Queensland, 1995a, p. 3).

The accompanying Guidelines were developed to support the Policy document and to be read in conjunction with it. The introduction indicates the perspective adopted toward new technologies in the Guidelines:

- the use of computers pervades modern society;
- the use of computers has significantly affected the rate of change in society and has largely determined the nature of this change;
- the use of computers is now regarded as a means to achieve and extend curriculum goals (Department of Education, Queensland, 1995b, p. 1).

The Guidelines lay out aims and goals of computer use by learners and teachers. The aims espoused are that the use of computers by teachers and students will:

i. support and enhance the achievement of educational goals across the P-12 curriculum;
ii. take place in a flexible, responsive and challenging learning environment.

The goals assert that students will:

i. use computers for a range of purposes;
ii. develop skills in operating computers;
iii. develop an understanding of the role of computers in society;
iv. critically interpret and evaluate computer-mediated information;
v. develop skills in information management;
vi. develop appropriate attitudes to the use of computers.

Teachers will:

i. develop skills in the use of computers for their own ends, such as administration, preparation and presentation;

ii. incorporate the use of computers as a teaching/learning tool in achieving and extending curriculum goals;
iii. ensure equitable access, participation, and outcomes for students in their use of computers;
iv. participate in ongoing discussion and experimentation related to the use of computers in the curriculum (Department of Education, Queensland, 1995b, p. 3).

Significantly, these aims and goals address teachers as well as learners. Explicit reference is made to the need for professional development and support to be provided by the department in the form of systemic incentives, as well as for support to be provided by individual schools. Teacher education is one of the "key principles underlying the effective use and study of computers in learning". The focus on professional development for teachers is underlined by the statement that "the provision of support, advice and access to professional development programs in the use of computers for learning will determine the extent and pace of teachers' adoption of computers as an educational technology" (Department of Education, Queensland, 1995b, p. 7).

The Guidelines address particular themes under the following section headings: "curriculum applications", "understanding learners", "learning and teaching processes", "learning environments", and "review and evaluation". Each key learning area is addressed in the curriculum applications section, offering examples of possible applications. The segment on English refers primarily to using computers for word processing, but also mentions the possibility of critically evaluating "the image of computers in popular culture", the importance of comprehending "the structure of [software] texts", and "the development of spoken language skills in the use of adventure and simulation software" (Department of Education, Queensland, 1995b, p. 13). We see here, again, the influence of the language/literary paradigm prevailing over a well developed *literacy* (as a sociocultural phenomenon) perspective.

The approach to learning taken by the Guidelines is that "any educational program incorporating the use of computers must accommodate the student as an individual and independent learner as well as a member of a group that shares similar developmental and learning characteristics" (Department of Education, Queensland, 1995b, p. 23). These shared characteristics are set out in an organisational table providing examples of "implications for computer use" (Department of Education, Queensland, 1995b, pp. 24-28). For example, "young children learn through play" is identified as a shared characteristic of early childhood education. An associated implication derived from this is that "with teacher support and guidance freely available, [young children] should have opportunities for self-directed play and expression on computers" (Department of Education, Queensland, 1995b, p. 24). Shared characteristics are grouped partly under education levels: early childhood, middle childhood, adolescent, young adult. Other identified groupings are organised around "students with particular needs: learning difficulties, outstanding ability, gender, disability, economic impoverishment, ethnic background, and geography" (Department of Education, Queensland, 1995b, pp. 27-28).

Learning and teaching is presented in terms of engagement in "worthwhile activities", defined in terms of being linked to other contexts, having a clear focus or purpose,

and being efficient in terms of time and learning outcomes. Principles for organising worthwhile activities include balance, cumulative learning, structure and sequence, and variety (Department of Education, Queensland, 1995b, pp. 29-32).

Introducing computers into learning environments is seen to involve "important decisions concerning the selection and location of resources and the development of management systems for both material and human resources" (Department of Education, Queensland, 1995b, p. 33). Lists of issues to be considered when purchasing and "managing" software and hardware are provided, along with various models for locating hardware and the advantages and disadvantages associated with each option. Discussion of classroom management also lists options and issues to be considered when grouping students.

Review and evaluation processes are addressed at the levels of classroom and school programs, in terms of expectations of the system as well as the expectations and needs of the local community and students in general.

A third document has recently appeared in the technology and computing domain. It has been designed to assist implementation of Queensland's*Computers in Learning Policy.*

7. Education Queensland, (1997). Schooling 2001: School kit 1997-1998. Brisbane: Education Queensland.

The ways the department will assist schools to achieve the goals and aims of the Computers in Learning Policy are outlined in a recent publication, *Schooling 2001: School Kit, 1997-1998*. Published in 1997, this describes the current initiatives of Education Queensland (formerly, Department of Education, Queensland), in the area of new technologies. The motif of this publication is captured in a front cover statement: "Improving student learning outcomes through the integration of computers in the curriculum and bringing world-wide information resources to Queensland state school classrooms" (Education Queensland, 1997).

The Director-General's foreword speaks of the I-Generation: today's students who "interact effortlessly with the new information and communications media" (Education Queensland, 1997, p. iii). The Schooling 2001 initiative is set in the context of "an urgent need to move to a new educational paradigm if our schools are to be relevant in the new millennium" (Education Queensland, 1997, p. iii). In this context, "we need to review the structure and organisation of the school day, the curriculum, teaching strategies and assessment practices and to identify the skills needed by teachers to operate in this new environment". The professional development and training of teachers emerges as the major focus of the 2001 project.

2001 is, in fact, a set of projects, described as learning technology grants, submission-based projects, and systemic initiatives. Learning technology grants include a computer maintenance project, a professional development grant, and an enhancements grant. All schools will receive funding for computer maintenance in each year of the project, from an annual pool of $12.375m. Each school will receive "additional funding for professional development and learning technology

enhancements in one of the three years of the project" (Education Queensland, 1997, p. 6). Funding for professional development programs totals $3.4m and for enhancement programs $3.625m. This additional funding has been allocated to Leading Schools for 1997-98, and 200 other Band 4-7 schools. Selection of the latter schools "will be needs based, relating to the current ratio of computers to students" (Education Queensland, 1997, p. 6).

Directing funding toward Leading Schools accords with the larger departmental policy strategy, in which the Leading Schools Project is a key plank. Principals were invited to participate in this project, which was designed to trial new systemic initiatives such as establishing school councils and further devolving funding and other decision-making processes to schools. Participating principals received a pay rise and assurance that extra funding would be made available to their schools—funding arrangements for the 2001 Project being an example.

Four submission-based projects are described in *Schooling 2001* (Education Queensland, 1997, p. 7):

i. the telelearning project, with $0.188m allocated, involves maintaining or initiating telelearning projects "to enhance curriculum choices for students and/or professional development for teachers". All schools are eligible to apply for funding here;
ii. the Professional Development Project focuses on small schools (Bands 4-7) and schools in rural and remote areas. $0.84m is provided to assist clusters of schools to develop and deliver professional development programs;
iii. the Lighthouse Professional Development Schools Project, which is open only to Leading Schools, has $0.84m funding available "to deliver on-site professional development and show case best practice in the use of computer technology for learning";
iv. the Curriculum Courseware/Software Project is also available only to Leading Schools, and takes the form of subsidies totalling $0.975m.

Nine systemic initiatives are outlined briefly in *Schooling 2001*. No details of funding levels or means of allocation are provided. These initiatives include: extending the existing Connecting Teachers to the Future Project; a Teacher Learning Technology Competencies Project; and the Global Classrooms Project, under which all schools will be provided with Internet access by December 1998. The Teacher Learning Technologies Competencies Project relates directly to the aims and goals of the *Guidelines for the Use of Computers in Learning* The competencies have four dimensions: Information Technology skills; curriculum applications, including classroom planning and management; school planning; and student-centred learning. Each dimension has three levels. Level 1 will be trialed in Leading Schools in 1997-98. *Schooling 2001* sets out the Level 1 competencies in a table providing descriptors or indicators for each dimension. These are to be checklisted by teachers to ascertain their level of competency. The student-centred learning dimension, for example, includes applying the principles of effective learning and teaching in using learning technology. "Providing a supportive and challenging environment" is one of the

descriptors, with "Creates a warm supportive atmosphere which fosters risk taking" being an associated indicator (Education Queensland, 1997, p. 49).
The Management and Learning Technology Plan (MALT) is associated with the Competencies Project. All schools are expected to have developed a 3-5 year plan during 1997-98. *Schooling 2001* provides a framework for the plan, one section of which must detail explicit outcomes and strategies, with associated performance indicators.

## *Technology*

This section deals with three documents

8. Cosgrove, M., (1994) . Technology and applied science. In Department of Education, Queensland, Shaping the Future: Review of the Queensland school curriculum (The Wiltshire Report). 3 volumes. Brisbane: State of Queensland Government Printer, pp. 350-69.

9. Taylor, A., (1994). Technology education. In Department of Education, Queensland, Shaping the Future: Review of the Queensland school curriculum (The Wiltshire Report). 3 volumes. Brisbane: State of Queensland Government Printer, pp. 377-90.

10. Department of Education, Queensland, (1995c). Technology in Queensland Schools—A framework for discussion. Brisbane: Department of Education, Queensland.

The first two papers were commissioned for the Queensland Curriculum Review, *Shaping the Future*. The third is a discussion paper produced in the wake of Technology becoming a core curriculum subject in accordance with recommendations of the Queensland Curriculum Review.

Cosgrove's paper focuses on reviewing a range of high school technology syllabuses available in 1993, in the context of countries like Australia beginning to plan for Technology Education—as distinct from technical education—to be a component of the general education for all students. Cosgrove criticises the Technology curriculum profile for Australian schools on the grounds that it is too narrow, urging instead the widest possible conception of what technology education in schools might be. Rather than propose an alternative approach, Cosgrove identifies examples of sound program visions where they exist in current state syllabuses. He advocates and defines five criteria to guide subject content in technology education:

i. relevance to learners' lives;
ii. the significance of the technology currently and historically;
iii. inclusivity, in terms of gender sensitivity, multicultural scope, and accessibility for physically and intellectually challenged learners;
iv. authenticity, in the sense of representing technology accurately as intellectual endeavour;

v. progressiveness, in terms of representing a post-industrial view of work, and dealing with important social, moral, economic, and political issues.

Cosgrove (1994) cautions against the tendency for technology education to lean towards Design and Technology syllabuses. He suggest the possibility of a fruitful integration between technology and science syllabuses in the form of "techno-science enterprise"—the creation and refinement of devices, systems, ideas, and ways of thinking. A suitably developed techno-science curriculum at lower grade levels could ask questions addressed by senior studies in sciences and technology, constituting a kind of spiral curriculum.

Taylor's paper also reviews high school technology syllabuses against the backdrop of international developments in the area. He identifies international convergence on four key criteria for effective technology education. These are that programs support and encourage creativity and problem solving; facilitate understanding of analytic and physical processes; develop an appreciation of function, form and finish; use technology skills to bring the design concept to domestic/commercial standards. Taylor (1994) recommends pursuing a well-developed, experiential, integrated technology base for informed decision making by means of a three-step curriculum model:

- P-6. Technology education across the curriculum. Interacting with the made world—technological concepts—decision making, producing, and communicating;
- 7-8. Technology education as part of the core curriculum. Plus continuation of technology education across the curriculum;
- 9-12. Technology education as part of the elective stream. Materials, food, fibre, electronics, transpiration, manufacturing, graphics, technology studies, agriculture.

Taylor notes that in several Queensland syllabuses falling within the ambit of technology education—Junior General Shop A, Junior General Shop B, Junior Graphics, Junior Agricultural Mechanics, Senior Technology Studies, Senior Graphics, and Senior Engineering Technology—expanding technological vocabulary and reinforcing listening, reading, writing, and speaking skills are explicitly identified as learning aims.

Following the decision to include Technology Education as a component of the Year 1 to 8 core curriculum, the Queensland Education Department published a discussion paper, Technology in Queensland Schools—A Framework for Discussion, in 1995. This 82 page document examines the structure and context of the national technology statement and profile to provide background to inform discussion about the future role of technology education in Queensland schools. It is presented in four parts: technology as a learning area; technology education internationally; technology education in other states; and technology education in Queensland.
The discussion of technology as a learning area eschews the common equation between technology and computers. It advances a broad conception of technology education based on five key purposes: to enable students to develop knowledge and confidence to select and use a range of technologies appropriately; to develop students' technological capability; to provide students with skills and knowledge to

appraise their own and other people's solutions to technological problems; to develop students' ability to examine critically the impact of technology on society and the environment; and to assist students to cope with escalating innovation and change and to become aware of the range of technological careers. Science and Technology are compared as pursuits in terms of Science being a way of knowing, and Technology a way of doing.

The overview of technology education in other countries considers goals and curriculum approaches from England and Wales, Northern Ireland, Scotland, the USA, Canada, Sweden, New Zealand and Japan. It notes that none of these countries highlights communications and information technologies in technology education curricula. Instead, the components of creative design, solving interesting problems, using materials to construct, and appraising products and processes emerge as the common themes.

Discussion of technology education in other Australian states continues the theme of Communication and Information Technologies (CITs) not being highlighted in extant program statements. The survey indicates that use of computers within technology education is mainly confined to their application in specific design tasks. Engaging CITs with respect to language and literacy issues is not developed. Indeed, the survey suggests that the idea of students learning to communicate about technology issues and projects is given little more than lip service within existing technology education programs.

Following the review of curriculum by the Wiltshire Committee (Department of Education, Queensland, 1994*c*), Technology has become a core curriculum subject for Years 1-8, although the Queensland syllabus has still to be finalised.

## *VICTORIA*

In this section, the following policy statements are examined:

1. Ministry of Education, Victoria, (1986). English and computers P-12: Recommendations for the use of computers in English and English as a second language for years P-12. Schools Division. Melbourne: Ministry of Education.

2. Ministry of Education, Victoria, (1988). The English Language Framework: P-10. Melbourne: Ministry of Education.

3. Board of Studies, Victoria, (1995a). Curriculum and Standards Framework: English. Carlton: Board of Studies.

4. Board of Studies, Victoria, (1995b). Curriculum and Standards Framework: Technology. Carlton: Board of Studies.

5. Directorate of School Education, (1994). Technologies for enhanced learning: current and future use of technologies in school education. Government

Working Party on the Use of Technology as an Education and Communication Facility in Schools, Melbourne: Directorate of School Education.

6. Board of Studies, (1997a). Information technology in English: Using information technology to help students to achieve the learning outcomes in the English key learning area. Carlton: Board of Studies.

7. Board of Studies, (1997b). Information technology in technology: Using information technology to help students to achieve the learning outcomes in the Technology key learning area. Carlton: Board of Studies.

### *The Analysis*

1. Ministry of Education, Victoria, (1986). English and computers P-12: Recommendations for the use of computers in English and English as a second language for years P-12. Schools Division, Melbourne: Ministry of Education.

This document recognises that teachers were already exploring the possibilities of using computers in English language programs P-12 and takes as a basic premise that the computer can be a valuable tool in "enabling students to develop and extend their abilities in using language" (Ministry of Education, Vic, 1986, p. iii). The booklet (77 pages) offers practical guidance on ways of using computers to support classroom language programs. It recognises the advent of computers as part of the processes of change. Further, it refutes the fear, probably more widely spread among teachers at that time than today, that the use of computers might lock children into isolated learning situations. It argues that when used for language purposes in social situations, then the computer can be "a valuable new tool for language learning" (Ministry of Education, Vic, 1986, p. iii).

The document, prescient in its understandings of the potential importance and value of computers for language education, recommended that all students P-12 should have continuous access to computers and opportunities to use them both individually and cooperatively. It also recommended the provision of opportunities to use word processors in the preparation and presentation of written work in all subjects. It is dismissive of drill and practice software, and recommends the allocation of time for students to acquire keyboard skills, but not at the expense of handwriting development. It suggests that language learning programs from P-12 should be taken into account in the formulation of school computer policy and that school councils, administrators and hardware and software manufacturers should be made aware of language learning needs in relation to computers. Finally, it recognises that although just beginning to understand the influence of the uses of these new technologies, systematic investigations need to continue.

This document is noteworthy here on at least two grounds. First, at a relatively early stage, it acknowledged the potential value of the use of computers for language learning from P-12 and across the curriculum. Second, the document is informed by a sociocultural approach to language learning and assumes that computers sit comfortably with such an approach.

2. Ministry of Education, Victoria, (1988). The English Language Framework: P-10. Melbourne: Ministry of Education.

The English Language Framework was designed to help schools formulate their English policies, develop their programs and devise activities. The Framework posits two principles: first, to provide effective access to all students; second, to recognise that language growth is a developmental process. In the chapter entitled, "The importance of English language learning", a section is devoted to "Using word processing equipment" (Ministry of Education, Victoria, 1988, p. 15). It asserts that the use of word processing "is leading to a radical transformation in the way people approach writing tasks". It also claims that "the use of word-processing equipment is proving beneficial by allowing effective group discussion of developing work" (1988, p. 15). While this reflects implicit awareness of the operational and the cultural dimensions of technology and learning, no mention is made of the critical. Later in the document, in "The English Language Learning Chart", under the column "Principles", the claim is made that "[w]ord processing facilitates success; it fosters logical, sequential expression and is a tool which can enable students with specific problems to develop writing skills" (1988, p. 48). However, it must be pointed out that it would have been difficult to support such claims with research evidence both then and now. The language learning goal is: "To use technology as a tool for learning: reading, writing and problem solving" (1988, p. 48). The recommendation for practice is: "To use the word-processor to assist students to: develop writing process and style, improve spelling, explore and manipulate ideas in the development of texts" (1988, p. 49). In the "Recommendation for practice (Writing)", emerging from this goal, the Framework suggests that teachers have a variety of software for language development, ensure that all students are introduced to keyboards, but not at the expense of handwriting. It recommends that students be encouraged "to produce a quality final product by: experimenting with text, changing, deleting, transposing, spelling correctly" (1988, p. 88); and also that students use word processing "for essay presentation of successive drafts and copies; as an opportunity for discussion, dissemination and display of work" (1988, p. 88). Further it suggests that teachers "Evaluate the effectiveness of computer software" by asking "whether it: explores the topic to which it relates, is suitable for students to use by themselves, is interesting, is flexible, fits in with school policy and curriculum" (1988, p. 88).

In the discussion of resources for the writing program, the Framework suggests that "[w]ord-processing equipment should be readily available to enable students to revise and redraft their writing easily and to facilitate collaborative writing and group work" (Ministry of Education, Victoria, 1988, p. 31).

For its time, this document was forward-thinking in its recognition of the value of computers as writing machines. It builds on the earlier "English and Computers P-12" in creative and appropriate ways. It also highlights the need to approach software, at least, with a critical eye.

3. Board of Studies, Victoria, (1995a). *Curriculum and Standards Framework: English*. Carlton: Board of Studies.

The CSF English is part of a larger document that includes all eight KLAs and is intended to provide the basis for curriculum planning in Victorian schools. The basic structure is derived from the National Statements and Profiles, with the CSF claiming to "build[. .. ] on and advance[. . .] the important work undertaken by the national project". The focus of the English Framework is on "English language learning, and "the content of English" is presented as "the texts spoken, read, viewed and written", with student development reflected in "the increasing complexity and challenge of the texts, increasing control of a widening range of texts, and an increasing awareness by the student of context, purpose and audience" (Board of Studies, Vic, 1995a, p. 9). Language development is seen as "the responsibility of all teachers", and involves the familiar threefold focus of “learning language”, “learning through language” and “learning about language”. This order of presentation is significant: "it is from learning language and learning through language that students will come to need, and benefit from, learning about language. *A particular purpose of the English program is to teach knowledge about language*" (Board of Studies, Vic, 1995a, p. 9, our emphasis). Development of literacy is identified as “central to the English curriculum”. In the Introduction, under the heading "Literacy", specific acknowledgment is made of the implications of new technology:

> The increasing use of technological tools has implications for literacy acquisition and development. New and emerging needs such as “computer literacy” mean that different uses of literacy need to be considered in the classroom. (Board of Studies, Vic, 1995a, pp. 9-10)

English is organised into four strands—”Texts”, “Contextual Understanding”, “Linguistic structures and features”, and “Strategies”—with each strand in turn organised into three modes: “Speaking and listening”, “Reading”, and “Writing”. “Reading” here subsumes “viewing”, in referring to "all ways of constructing meaning from texts, including non-print ones" (Board of Studies, Vic, 1995a, p. 10). In the section on "Texts": "Texts is taken to mean broadly any communication involving language":

> The texts strand may thus include speeches or conversations, novels, story books, newspaper articles, personal letters, handwritten stories and reports, posters, performances of plays or films, and advertisements. Texts also include the communications composed on, or transmitted by, computers or other technological tools. (Board of Studies, Vic, 1995a, p. 11)

There are three categories or domains of “texts”: "literature", "everyday texts" and "mass media". Under "everyday texts": "Everyday texts . . . include . . . computer-mediated texts such as electronic mail and bulletin boards" (Board of Studies, Vic, 1995a, p. 11). Under "mass media" texts, it is stated that:

> Mass media texts are taken to mean those spoken, print, graphic and electronic text forms that communicate with a public audience. They often involve numerous people in their construction and are usually shaped by the technology used in their production. The mass media texts studied in English include news reports, personal viewpoints, advertising, drama, documentaries and reviews. The texts are found in newspapers, magazines, cartoons and posters, on television and video, film, radio, computer software and information networks. (Board of Studies, Vic, 1995a, p. 11)

It is notable, however, that explicit reference to the new technologies is not mentioned until Level 3 (corresponding to the end of Grade 4). Hence English and its specific literacy project is oriented towards language and hence towards “text”, and effectively downplays the significance of technology, given that it is only in mass media texts that technology is seen as having a shaping or formative influence; presumably elsewhere it is regarded as either neutral or as simply irrelevant.

There are scattered and sporadic references to technology and more specifically to computing. Under Level 3 strategies, for instance, students "develop strategies for reading from a computer screen" (Board of Studies, Vic, 1995a, p. 40); at Level 4 (end of year 6), under "texts": Students "read and view factual materials on a wide range of topics in texts that include technology such as CD-ROMs, electronic mail and databases" (Board of Studies, Vic, 1995a, p. 42), while under "strategies", students "undertake independent research that develops appropriate information from a range of texts including CD-ROMs" (Board of Studies, Vic, 1995a, p. 48) and also "effectively use graphic software and word processors including a spellchecker, when writing" (Board of Studies, Vic, 1995a, p. 48). At Level 5 (end of Year 8), under "texts", students are to "develop skills in interpreting and recording information, for example, writing a point-form summary, taking minutes or compiling an agenda for meetings, and through using computer technology" (Board of Studies, Vic, 1995a, p. 50); under "linguistic structures and features", they "use computer technology to facilitate the organisation of the linguistic structures and features of writing" (Board of Studies, Vic, 1995a, p. 54), and under "strategies", "develop a variety of strategies for gathering information including the use of data bases and CD-ROMs" (Board of Studies, Vic, 1995a, p. 56). Finally, at Levels 6 & 7 (end of Year 10), under "texts": "Students continue to develop skills in using word processors, electronic mail, information networks, computer conferences and bulletin boards" (Board of Studies, Vic, 1995a, p. 58).

In summary: While information technology in its various forms is not neglected in the English Framework, it is fair to say that it is presented as simply another medium. This enables the emphasis to be placed on what might be called “content” production and reception, as well as on the *form* of “delivery”, with the *means* left undealt with. While this is consistent with, for instance, the manner in which “content” is addressed in documents such as “Creative Nation”, it nonetheless remains problematic because it rests upon the entirely questionable presupposition of the *neutrality* of technology, more particularly with reference to communications.

4. Board of Studies, Victoria, (1995b). *Curriculum and Standards Framework: Technology*. Carlton: Board of Studies.

The Technology CSF is similarly consistent with the National statement and Profile on Technology in Australian Schools. It is organised into three strands of learning—"Materials", "Information" and "Systems"—with each strand in turn organised in terms of "four phases, collectively called the technology process": "Investigating", "Designing", "Producing" and "Evaluating". As with the national curriculum documents, it is the Information strand that is most directly pertinent here. "Information" refers to "data processed and presented in a way that makes it useful and that provides people with knowledge". It can be "stored, retrieved and communicated using visual, aural, tactile and olfactory senses", and students use "a wide range of equipment, techniques and procedures to process and communicate information to meet particular needs" (Board of Studies, Vic, 1995b, p. 13). Both "information" and "information technology" are referred to directly (Board of Studies, Vic, 1995b, p. 13).

It should be noted that the "Systems" strand might also be drawn into some consideration here, referring as it does to "combinations of human and technical elements that work together to achieve specified outcomes", and thus inclusive of "computers" and "communication networks" (Board of Studies, Vic, 1995b, p. 13). However, no explicit cross-reference is made to the English CSF, and opportunity is therefore missed for making fruitful links between English and Technology with specific regard to matters of language and technology, text and information and, hence, to literacy more generally.

There does not appear to be a document purporting to represent current policy about technology or, more specifically, about literacy and technology in schools. Available on the Department of Education (DOE) Web site is a draft form of the Information Technology Planning Guide. A more recent version is available in hardcopy from the DOE and the final version, some 600 pages, will be made available soon. Rather than policy, it provides teachers with "guidelines", of a kind which may be more appropriate in rapidly changing times in which new needs and requirements are identified daily. A chart is available for both the English and Technology Frameworks, addressed in both instances to "using information technology to help student achieve the learning outcomes" in both the English and Technology key learning areas. It is organised vertically across the seven Levels of schooling and horizontally in terms of "Application" ("File Management", "Word Processing", "Graphics", "Multimedia", "Electronic Communication", "Database", "Spreadsheet", "Desktop Publishing", "Simulation/Modelling"). For instance, at Level Six, the example given for Desktop Publishing is as follows: "Creates text, selects and modifies graphics, designs layout and imports into planned templates, e.g., creates the template, the text and scans the photograph of a celebrity to produce an advertising brochure".

In Victoria, the Schools of the Future program forms the centrepiece of the policy environment, following the election of the Kennett Government in 1992. In essence this has involved a systematic devolution of finances and management, as well as curriculum and administration more generally, in accordance with the ethos of the "self-managing" school. Among subsequent initiatives is the Classrooms of the Future

program, linked to which is the Navigator Schools program and related forms of "lighthouse" professional and curriculum development. The key document of relevance here is what is commonly called the Smith Report (Directorate of School Education, 1994), "Technologies for Enhanced Learning". As noted inTinkler, Lepani and Mitchell (1996, p. 10), while Victoria has "no fixed information policy", due largely to the fact that "such a rapidly developing area made it almost impossible to keep up with developments", it could nonetheless fairly be said that "the Smith Report . . . had become *de facto* policy guidelines for information technology in education". This document warrants further and focused examination.

5. Directorate of School Education, Victoria, , (1994). Technologies for enhanced learning: current and future use of technologies in school education Government Working Party on the Use of Technology as an Education and Communication Facility in Schools. Melbourne: Directorate of School Education.

This widely cited document has contributed greatly to popularising talk of "learning technologies" and the notion of enhancing learning through the use of new technologies. The original brief was to report to the Minister on the "use of current and future technologies in schools", with the "ultimate aim of the investigation" being:

> to place Victoria in a position where, using quality technology to best advantage within systems and across sectors to enhance student learning, the State can lead in delivering world-class educational opportunities for all students. (Directorate of School Education, 1994, p. 1)

It is claimed at the outset that developments in electronic technologies "now have the potential to bring about a revolution that could parallel the impact on education of the development of the printing press" (Directorate of School Education, 1994, p. 1), despite the fact that in most schools currently the potential of the technologies in this regard is yet to be realised, or even seriously considered. The document continues:

> Application to school learning of information technology on a grand scale is inevitable. It will not only bring about a dramatic change in the way students interact with teachers, but could give new meaning to "knowledge" and provide a different approach to the way knowledge is generated and manipulated. (Directorate of School Education, 1994, p. 1)

The focus is specifically on "electronic information and communications technology and its application to teaching and learning", in the context of a timely "convergence of educational ideas meeting those of technology (Directorate of School Education, 1994, pp. 1-2). "Should such a convergence occur", it is asserted,

> it could produce a powerful new synergy bringing advantages to both education and technology, having the potential to speed up the advance towards more appropriate application of the newer information technologies to school education and

> more effective approaches to learning and teaching. (Directorate of School Education, 1994, p. 2)

Accordingly, the Working Party believes the Department of School Education (DSE) is well positioned to take the lead in "encouraging such a convergence, which would be in the interests of all learners and significantly benefit the whole society" (Directorate of School Education, 1994, p. 2). Reference is made to the importance of accounting fully for "the human dimension" in such developments and challenges, and of the need for "structured professional development programs based on information technology and an understanding of such matters as learning, change and the factors that affect school culture" (Directorate of School Education, 1994, p. 2). “Multimedia” is identified as a primary focus:

> Multimedia technology offers considerable potential for delivering learning programs on stand-alone or networked computers within the classroom or beyond the classroom. Its eventual effectiveness as an educational tool will depend upon the quality of the content and the way the software is presented to the students, as well as how teachers generally apply the medium. Not only are there software programs to reinforce basic literacy and numeracy skills, but there is now a range of new interactive software that recognises the importance of the teacher as a facilitator of the learning process. (Directorate of School Education, 1994, p. 2)

“Learning” features prominently as a keyword, as does “networking”. Stress is placed on the notion of "Open Learning"—as distinct from “Distance Education”—with emphasis on associated concepts of “choice”, “flexibility” and “lifelong learning”. Further, science and technology are conceived as absolutely central in the reorganisation and reconceptualisation of education and schooling.

No statements are addressed specifically to literacy and the new technologies, although a tacit concern with this theme might be read into the document—granted the assumption that literacy is fundamental to curriculum and learning, and central to the technologisation of society and school. It seems more reasonable, however, to see this omission as an index of the systematic failure to understand the fundamental linkage of literacy and technology, and the profound significance of literacy as itself a key “learning technology”. At issue, is the shift of schooling in Victoria towards a generalised “open learning” model, with information technology perceived as the key to the profound changes envisaged in the structure and function of schooling. “Open learning” applies to "off or on campus, even within the traditional four-walled classroom". Its distinguishing feature is that it involves students having "some control over the ‘what’ and ‘when' and 'where' and 'how' of their learning" (Directorate of School Education, 1994, p. 15). Congruent developments in information technology and educational theory "promise to transform the way computers and other forms of information technology are used in schools":

> With appropriate hardware and working with the newly emerging software programs, students not only have the flexibility of choosing, what, when, where and how the learning

> takes place, but they can interact with teachers in new ways. (Directorate of School Education, 1994, p. 15)

Teaching is thus potentially reconceptualised as “facilitation” and “co-learning”, and the classroom becomes more markedly a “learning community”. Similarly, school libraries undergo change, since "[w]ith the introduction of open learning approaches", plus the information technology revolution, "librarians may find students increasingly will require information that calls for supplementary information beyond the school site" (Directorate of School Education, 1994, p. 19).

A section on "Educational theory and practice" (Directorate of School Education, 1994, pp. 39-40) discusses the emergence of “constructivism”—"an educational idea to be applied to curriculum design and instruction", based on the notion "that humans “construct” their own *reality* or world picture which is dependent upon the range and quality of individual experience". While bringing a new emphasis to bear on “experience” in the learning process", this position stresses "the importance of the quality of the experiences, whether provided by computer software or by way of other factors applying within the learning situation" (Directorate of School Education, 1994, p. 39). The argument is made that constructivism provides "a theory to support effective teaching for enhanced understanding about the world". Both educational theory broadly and information technology in particular have been "travelling over similar ground", and the suggestion is made that the two should now converge to "form a powerful synergy" (Directorate of School Education, 1994, p. 40). In effect, this constitutes the possibility for a new educational paradigm:

> A rethink, the adoption of a constructivist position and a move towards a convergence of education and technology would enable teachers to capitalise on the full educational potential provided by the new software tools, generating a powerful new force for transforming school education. (Directorate of School Education, 1994, p. 41)

It is clear the document places great store in the revolutionary and transformative implications of the new technologies with regard to education and schooling. It is strongly oriented towards the mathematico-sciences in its view of curriculum, with a focus accordingly on scientific and technological “literacy”: "An education in science is essential to understand the interrelationship of science and technology in today's technically sophisticated society" (Directorate of School Education, 1994, p. 53). However, it is unclear to what extent this use of the term “literacy” is simply metaphorical; for instance, an earlier formulation evoked the notion of "a technologically literate community" (Directorate of School Education, 1994, p. 3). Opportunity to make direct connections with literacy education and with English teaching, and with other traditionally non-technological curriculum areas such as the Arts, are overlooked. For example, specific reference is made to "the need to understand a new language, the language of computers":

> Any skimming of articles in the computer pages in the daily press will reveal words such as Windows, menus, files, folders, documents and formatting, all terms which for non-users have very different meanings. But what does the novice make of

> Kilobytes, Megs, dialog box, fonts, macros, function keys, MS-DOS, CD, CD-ROM, CD-i and RAM. These are but a small portion of the extensive computer language a novice has to come to grips with in becoming conversant with the new educational technology. (Directorate of School Education, 1994, p. 69)

That this might be an appropriate focus for English lessons, or that there are implications here not just for language and literacy education but also for making active links between language and technology education, are matters that are simply never considered. This is notwithstanding specific observations on and recommendations for libraries, considered in direct relation to their role in managing new demands and forms of information and technology, and not at all in their implication in the literacy work of the school.

6. Board of Studies, Vic, (1997a). Information technology in English: Using information technology to help students to achieve the learning outcomes in the English key learning area. Carlton: Board of Studies.

This chart is one of a set of eight similar charts created for each of the eight key learning areas. They represent the most recent incarnation in Victoria of professional development activities for teachers in IT since the publication of the Smith Report.

Presented as a chart, but also available on the Board of Studies' Website, this document represents an innovative way in which to summarise the connections between IT and the English key learning area in terms of learning outcomes. The horizontal arm identifies seven IT applications (file management, word processing, graphics, multimedia, electronic communication, database and desktop publishing). The vertical arm groups functions associated with each application. For example, the functions of “multimedia” are presented as accessing, creating, integrating and linking, while “desktop publishing” includes creating text, creating graphics, designing layout and importing data. The intersection of application and function is presented on the chart for the each of the seven levels intrinsic to the Curriculum and Standards Framework. Thus at Level 5 “multimedia”, the suggestion is that, in terms of learning outcomes, the student “combines different data types to form linked files, e.g., integrates data for a documentary program about an issue in the media”. And for Level 7 “desktop publishing”, the student “creates and modifies multiple-page documents applying accepted conventions, e.g., prepares a children's picture story book”.

The charts represent a creative way in which to characterise the connections between Information Technology (IT) and English. As a very recent publication in the area, it indicates that more direct and explicit connections are now being made between the two areas. The chart suggests IT is perceived as a powerful tool to enable students to achieve important learning outcomes.

7. Board of Studies, Vic, (1997b). Information technology in technology: Using information technology to help students to achieve the learning outcomes in the Technology key learning area. Carlton: Board of Studies.

Also part of the eight-chart set prepared by the Board of Studies for each key learning area, the IT in Technology chart names nine applications and nine functions for each of the seven levels of the Curriculum Standard Framework. For example, the application "electronic communication" is associated with five functions: retrieving, creating, uploading, linking and downloading. The application "simulation/modelling" has four functions: programming, designing, modelling and calculating. When these applications and functions are represented for the different levels, we see, for example, that Level 5 "electronic communication" suggests that as learning outcomes, the student "creates series of documents to unload to an electronic mail system, e.g., prepares data on issues associated with the use of a variety of energy sources, a design of a powered model vehicle and a photograph of a solar powered vehicle. For Level 7, under "simulation/modelling", the student "designs program using coded language to create simple pathway process, e.g., constructs a work plan for diagnosing faults with an automotive system".

As with the IT and English chart, the IT and Technology chart indicates the Board of Studies recognition that IT is intrinsic to the achievement of important student learning outcomes. IT is seen as offering the different key learning areas a rich resource and a major objective is for students to be able acquire skills in using IT effectively in each key learning area. The emphasis is definitely on the operational, although elements of the cultural are evident. There is, however, little reference to the critical dimension.

## *Key themes and major findings*

This section overviews the key themes and major findings of our investigation of the literacy and technology policy environment. It is appropriate at the outset to remind readers of the global and national context within which we carried out the analysis. It is also important to make several comments about the policy environment as the project drew to a close.

*The global context*

We live in new times marked by increasingly rapid, deep, and far-reaching change. Of particular relevance to this project is the observation that the social, political and cultural changes we are witnessing worldwide are intimately associated with, indeed, to a large extent enabled by, the growing use of new electronic communications and information processing technologies.

*The national and state context*

Rivalries and tensions between successive federal and state governments in Australia is a familiar story. Education policies, at federal and state levels, are affected by: which party is in power; who holds the education portfolio; the extent to which control of education within each state is more or less centralised; which ideologies are in the ascendancy. Further, these factors, and others, are played out in complex and often unpredictable ways. For example, we may think that a particular ideology, such as economic rationalism, is dominant at a particular time, but then discover that policies

reflecting notions of social justice and equity have also been formulated. Moreover, these times are notable for the emergence of new, hybrid ideologies so that old labels, which once provided us with a familiar, if not crude, shorthand for political practices, are no longer useful.

*The current policy context*

There have been a number of significant recent developments in the literacy field: a national literacy survey, literacy testing, and literacy benchmarking procedures. The federal Minister's literacy goals aim to ensure that “every child leaving primary school should be numerate and be able to read, write and spell at an appropriate level”. The policy emphasis is on early intervention for at-risk students.

At the same time, 1997 saw the publication of “Australian Literacies” (Lo Bianco & Freebody, 1997), to inform national policy on literacy education, and which, among other things, takes explicit account of the uses and significance of the new technologies in literacy education. More than previous documents, this volume makes progress toward seeing technology as both a resource and a context and makes links between the two. It also demonstrates understanding of the operational and cultural aspects of literacy and technology learning, although more attention could have been given to the critical.

Cognisant of the many political factors which complicate systematic analysis, we have constructed a comprehensive picture of the policy environment in relation to literacy, learning and technology. Concentrating on the period from the mid 1980s to the late 1990s, we have assembled different sets of knowledge about literacy, learning and technology. When we look at them together, we see the firm possibility of moving closer to the articulation of coherent, effective policies which take into account all three areas. We suggest that at both the federal and state levels, key departments look at what we have produced and consider how they may move toward more integrated policies, taking into account the significance of *both* literacy and information technology in and for learning and schooling, the interconnected relationship between them, the changing nature of literacy itself in increasingly technologised conditions, and the new and emerging cultural and curriculum practices.

***Key themes***

Our analysis has provided us with a bird's eye view of the Australian policy environment. This perspective has enabled us to identify a number of distinctive features.

*Escalating interest in literacy and technology since the mid 1990s*

We note that the political and sociocultural interest in literacy and technology has escalated over the past decade. In the mid 1980s, an interest in Information Technology (IT) began to develop. There has since been a major shift to the high interest which characterises the present. In the 1990s, IT has become *the* hot item. This attention is reflected in the policy work currently being done across the country. Much of this is directed toward teachers' professional development, focusing on the acquisition of confidence and skill in the use of the new technologies for pedagogical purposes. Underpinning the flurry of activity in the area of IT is the imperative to get teachers "up to speed" so that they can work more effectively with students in the use and application of the new technologies in all curriculum areas.

However, although a number of individual policy documents have made forays into articulating the important connections between literacy and technology, overall we have found very little which deals directly with "electronic literacy". This is despite our important observation that articulation between the two areas, literacy and technology, is essential.

*Divisions of labour*

We were not surprised to observe that the policy environment is distinguished by many different groups doing different things, apparently unaware, perhaps simply not interested, in the activities and pursuits of other groups, despite the possibility that they may share similar agendas. Specifically, the policy environment is marked by:

- different constituencies;
- different interest groups;
- different sites of production.

The result has been the creation of related but essentially discrete IT policies, Literacy policies and Education and other policies.

*Lack of conversations*

Not only are many different groups engaged in independent activities, but there has also been little dialogue between them. Clearly, what is needed is articulation between the literacy and the technology groups. Articulation is needed at all levels, but probably most importantly, at the school level.

***Major findings***

Our investigations provide us with a number of important findings:

*Speed and recency*

Our investigations remind us yet again of the speed and recency of these developments in the area of new electronic communications and information

processing technologies. Michael Joyce, hyperfiction author and co-creator of Storyspace hypertext software, calls it a state of “constantnextness” (in conversation).

*Context and resource model*

Elsewhere in this project, we make reference to the notion of examining literacy and technology through the context and resource model. The policy environment is part of the volatile context model. Although some of the early documents look at Technology largely as a resource, a more dynamic understanding is now apparent.

*Operational/cultural/critical model*

Understandings of the operational and the cultural, and the relationship between them, are evident in the policy environment. In our investigations, we have seen indications of apprenticeship and immersion models. By contrast, the critical seems still as yet underdeveloped except in isolated pockets. For example, we see versions of it in the Tinkler et al (1996) document and we begin to see it in the Lo Bianco and Freebody (1997) publication. However, overall, the critical is largely absent or muted.

# Chapter Five

## RECOMMENDATIONS

The investigators compiling the site studies, the faculty study, and the policy and theoretical chapters were asked to generate ideas for recommendations out of their work. Those from the site studies were collated, edited, and produced as a working set during the stage of writing the site studies synopsis chapter and distributed to the investigators for comment. Draft recommendations from other components were produced as appendices to individual chapters, and feedback from the investigators obtained.

When the entire draft report was complete the total set of recommendations was collated, reduced, organised, edited, and subjected to a final 'feedback and suggested revisions' exercise. Selecting and refining recommendations was based on the need to identify directions and goals that will enhance cost-effectiveness of funding provision for learning in the areas of literacy and technology. Our aim was to construct a brief and pertinent set of recommendations for each of the four main policy making groups:

- The Commonwealth Department of Employment, Education, Training and Youth Affairs (DEETYA)
- State and Territory school education administrations
- Australian Vice Chancellors' Committee (AVCC) and the Australian Council of Deans of Education (ACDE)
- Schools

### A. The Commonwealth Department of Employment, Education, Training and Youth Affairs (DEETYA)

We recommend that the Commonwealth Minister for Employment, Education, Training and Youth Affairs:

**A1.** Commissions the development of standards to cover:

- technology resources - to promote equitable access to services (eg. adequate and reliable telecommunication links), hardware and software;
- curriculum - to ensure scope and sequence of programs addressing literacy and new technologies, and to ensure coverage of the operational, cultural, and critical dimensions of learning;

- student outcomes - to ensure continuity, complementarity, and equity in development of skills, knowledge and understanding

**A2.** Work jointly with the Minister for Communications and the Arts, to establish mechanisms for providing Internet access to schools outside large centres on equitable terms with schools in large centres, by means of infrastructure development and reduced costs/subsidies.(See A1 above).

**A3.** Commissions a national review of preservice and inservice teacher education programs to:

- evaluate the availability and quality of current course offerings designed to develop theoretical and pedagogical competence in the areas of technological literacies and classroom applications of new technologies across the curriculum;

- make recommendations to the Deans of Education and MCEETYA

**A4.** Establish principles to promote cooperation and collaboration within developmental work in the area of literacy and technology as follows:

- policies, curriculum development, and professional development initiatives in the areas of Literacy and Technology should be planned in conjunction with each other and with informed input from all learning areas;

- policies at national and state levels should be developed conjointly.

**B. State and Territory Governments**

We recommend that state and territory school education administrations:

**B1.** Establish policy to guide resourcing decisions for technology and literacy in schools, based on the principles of:

- consultation with schools concerning technology needs and priorities in the context of schools' planning for learning outcomes in literacy and technology across learning areas;

- equity of access to current technology based on economically feasible options such as leasing;

- provision of appropriate technical and operating support proportional to investment in infrastructure.

**B2.** Adopt practices to promote equitable and effective resource provisions for literacy and technology learning by:

- encouraging strategic links between schools and community-based groups to make optimal use of existing technological infrastructure and expertise;

- employing educational advisers for all learning areas with proven expertise relevant to integrating new technologies into language and literacy learning activities;

- pursuing mutually beneficial partnerships with telecommunications industry providers and computer hardware and software (and other) businesses to develop strategies for addressing logistical, geographic, and socio-economic constraints to equitable learning opportunities involving new technologies.

**B3.** Establish policies and practices designed to meet the principle of 'teachers first'.

**B4.** Establish policies and practices to guide professional training and development through:

- developing competency standards for beginning teachers in the effective use of new technologies for classroom literacy development across the curriculum;

- investigating and pursuing innovative mechanisms to provide schools with strategic expertise relevant to promoting technological literacies and proficient use of new technologies across learning areas. Suggested strategies include:

    a) subsidising part time secondment to classrooms of Web site designers, computer graphics designers, software programmers, etc. from outside the educational sector to share experiences and skills;

    b) seconding unemployed, underemployed, retired people with relevant skills and expertise to classrooms and operating/technical support roles at teacher rates;

    c) employing relevant community-based sites and resources to provide on site learning opportunities for school classes.

- ensuring that inservice training and development is an integral component of initiatives to introduce new technologies into student learning (see Recommendation B1 above);

- ensuring that an appropriate balance between operational, cultural, and critical dimensions of learning is promoted within all inservice training and development;

- assisting schools to develop whole-school/across the curriculum approaches to inservice training and development.

**B5.** Collaborate with DEETYA to ensure that policies, curriculum development, and professional development initiatives in the areas of Literacy and Technology are

planned in conjunction with each other and with informed input from all learning areas.

**B6.** Instigate pilot projects which pursue approaches to achieving mandated learning outcomes by means of authentic, real life practices developed in accordance with cultural apprenticeship models of teaching and learning, and using community-based sites and resources as appropriate.

**B7.** Investigate the conditions required to make teaching a more attractive career option for individuals with qualifications, knowledge, experience and skills relevant to literacy and technology.

**C. Australian Vice Chancellors' Committee (AVCC) and the Australian Council of Deans of Education (ACDE)**

We recommend that:

**C1.** The AVCC encourage and support teacher education faculties to commit resources to ongoing staff development relevant to literacy and technology which:

- are suitably proportionate to investment in new technology infrastructure;
- take account of staff skill levels, provide multiple pathways, and encourage staff to become aware of unfamiliar applications;
- identify and draw upon existing expertise and innovation amongst staff to provide good practice exemplars for wider staff development;
- promote among leaders of organisational units skills and dispositions to provide incentives and other support for staff who actively pursue pedagogical excellence in the area of literacy and technology.

**C2.** The ACDE make pedagogical competence with new technologies a high priority in job descriptions when recruiting staff for teacher education positions.

**C3.** The ACDE develop policies and procedures to make literacy an across the curriculum focus of teacher education faculties, rather than the specialist domain of a discrete organisational unit.

**C4.** Teacher education faculties develop effective core subjects/courses/units with a technology and learning focus in all preservice programs, supported by ongoing development of technology in learning components within each curriculum learning area.

**C5.** Within teacher education faculties, all course developments in the areas of Literacy and Technology:

- be planned and developed in conjunction with each other;

- draw on informed input from all substantive curriculum areas;
- include components dealing with policy and practical dimensions of the three 'patterns' and four 'principles' identified in this project (see pages 18 - 23 above).

**C6.** Teacher education courses include components which address 'the structure of knowledge' in ways that prepare teachers to develop effective learning programs addressing literacy and technology based on statements of learning outcomes, as well as to handle the evaluative and critical dimensions of information.

**C7.** Teacher education faculties employ technical and operating support in appropriate proportion to their investment in new technologies.

**D. Schools**

We recommend that:

**D1.** Principals ensure that school technology and literacy policies and programs are developed:

- in conjunction with each other;
- with due reference to all learning areas;
- with attention to issues of continuity, complementarity, workability, and equity.

**D2.** Principals ensure that integration of new technologies into classroom teaching and learning be addressed as an across the curriculum initiative involving all members of staff.

**D3.** Principals provide incentives for teachers to develop effective links with other schools and community organisations to:

- share expertise and resources;
- undertake collaborative projects involving integration of new technologies into language and literacy learning.

**D4.** Schools work in collaboration with their state/territory or sector administration and other sources of expertise to achieve an appropriate balance between investment in new technology infrastructure, operational and technical support, and teacher professional development.

**D5.** Schools provide opportunities for parent and community members to participate in workshop activities involving new technologies.

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