

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

**VOLUME TWO**

**Site Studies**

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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 TWO

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## INTRODUCTION TO VOLUME TWO

This volume reports classroom based sites studies undertaken during 1996 and 1997. A synopsis of these studies, discussion of various issues and implications they generate, and a range of recommendations based upon them, appears in Volume One.

Classroom based sites investigated were located in three states: Victoria, New South Wales and Queensland. A range of geographical locations was covered, including inner city suburbs, outer city suburbs, satellite cities, regional rural 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, Mathematics, 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.

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 1. Classroom based site studies**

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

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

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 of the studies which follow. 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.

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.

It is important to clarify at the outset what the following sites studies aim to do and purport to be, and what they do *not* aim to do and purport to be. As noted in Chapter 1 (Volume 1), our sites are *not* case studies in any full-blown social scientific sense. For a start, our data collection was confined typically to just a few days at most in each site. It would be simplistic in the extreme for us to assert that such limited interactions provide us with a warrant for saying “this is how practice *is* overall in these sites”. We recognise that what is observed and recorded on any two or three days by no means provides a basis for describing practice in general. In some cases it may be a good guide, but there is no way of being sure about this. At the same time, however, the time we spent and the data collection methods employed are sufficient for capturing *illuminating* or even *telling* episodes of classroom activity—what are sometimes called “snapshots”—without them necessarily being exhaustive, or even typical.

Readers should understand this so that there are no misconceptions concerning what can be extrapolated from the data—how far it can be drawn. We feel such qualifications may also be important for some of the participants themselves who might otherwise feel concern that readers will make inferences about their professional selves on the basis of one, two or at most three observation periods. In



such a short time we could not hope to do justice to the complexity of their work or to that of the school. Despite the time frame we approached the research with the ideal of teacher as coresearcher in mind. This at least ensured the acknowledgement of, and the will to address, the imbalance of power inevitable in the procedures of observing and of being observed. We trusted the process of participant feedback and discussion to overcome potential conflict between what we “saw” and what participants “knew” was happening. Inevitably there were things we reported not seeing during our observations that do, in fact, occur—but simply did not occur while we were there. Sometimes we painted a picture which drew a start of recognition. At other times however we made inferences from the data which did not reflect back to the participants a landscape which they recognised. In all such cases we have negotiated with the participants and taken the fullest account possible of the points they made—which, invariably, were both reasonable and generative.

“Snapshots” provide a basis for recognising things that resonate with wider experiences—our own, and other people’s: instances of phenomena that occur elsewhere and at other times. In this way they provide a basis for reflecting on what *might* be more general phenomena—especially if one finds, as we often did, similarities across many of the sites we studied, as well as similarities between what we “saw” and what other researchers have described in other places and over longer periods of investigation. Wherever possible, we have tried to augment our immediate observations by asking participants to comment on aspects and events that seem to us to be interesting. This is a means for going beyond immediate observations, by obtaining accounts of participants’ beliefs, wider experiences, informing theories and understandings, etc., which are more abiding, and may reasonably be presumed to operate in other instances.

We have, of course, aimed to reflect, discuss and interpret what we experienced, rather than merely to describe. Our reflections and interpretations, like any, are corrigible. What we “see” is inevitably influenced by our own values, theoretical commitments, and beliefs about education, technology, learning, progress, and so on. We have described at length in Chapter 2 (Volume 1) key features of our conceptual and theoretical perspectives. Readers who are interested in exploring further why we “see” what we “see” in the events and episodes described below are invited to spend some time with our account of conceptual and theoretical considerations informing our work.

In brief, we have tried to capture *illuminating* instances of practice and to reflect on these, both in their own right and in their own terms and in relation to a larger picture built up collectively by the researchers across the various sites. Some studies covered several classrooms, and in most sites we draw on informants beyond those immediately involved in the settings described.

Some of what we portray would have been captured pretty much the way we have captured it by almost *any* researcher: such as an Internet connection failing; a program “crashing”; the sorts of applications being employed (CD-ROMs, email, word processing); the kinds of activity being engaged in (report writing, illustrating a text, compiling a database); and the purposes for which hardware and software were being

employed. These are more “palpable” features of practice that are more or less “objectively there” to be seen. Other aspects of what we portray, however, would likely be perceived, described, and interpreted differently by other people, whose conceptual, normative, and theoretical “baggages” differ from our own. In fact, individual researchers within the team bring with them different “baggage” to a greater or lesser extent. While we are generally committed to a sociocultural perspective on literacies, technologies, and social practice at large, we do not share a unilateral “project team” view of the world.

In each of the following sites studies, authors have aimed to make as clear as possible the conceptual, theoretical, and analytical tools, and the values and beliefs they have drawn on in providing their respective accounts. This is both ethically and pragmatically important, because we have advanced recommendations on the basis of the work we have done. While, of course, we hope that our recommendations are taken up, we recognise that they are corrigible. Teachers and students, parents, principals, administrators, researchers and developers, bureaucrats, and politicians may choose to accept or reject them. Our responsibility is to ensure that these decision-makers are provided with relevant information, presented as clearly and honestly as possible, that explains why we recommend what we recommend—so that they have an optimal basis for deciding what to accept or reject, and why.

This approach accords with our beliefs that in a “meta age” our educational endeavours *must* aim to develop thinking learners: learners capable of approaching their world in “3D”, and addressing it in operational, cultural, and critical terms. Citizens who cannot do this will be disadvantaged relative to those who can. In the final analysis, the best prospects for developing thinking learners lie in contributing to the ongoing development of thinking educators—whether parents, peers or principals, teachers, aides, advisers, etc.—who are in turn supported by thinking administrators, systems people, and politicians.

Our own part in this endeavour is to practise what we preach: to do our best to exemplify a thinking approach to our subject matter. We are not afraid to be “wrong”. But we *would* be culpable if we failed to live up to our beliefs and commitments, individually and as a project team. Foremost among these beliefs and commitments is the notion that living effectively and with dignity in the present and the foreseeable future will increasingly depend upon thinking about social practice and acting in the light of our thinking. In this project we aim to demonstrate our thinking, our processes of interpreting what we “see”, and our procedures for translating our observations, thoughts, information, and interpretations into recommendations for future practice.



## **ABBOTSDALE: THEORY INFORMED PRACTICE IN A YEAR 5 CLASSROOM**

### **1. *The study at a glance***

At Abbotsdale, 24 Year 5 students and their teacher operate 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. Robert relates pedagogical theory and practice very effectively, and the students were all visibly engrossed in their learning throughout the periods we observed. They produced an impressive range of learning outcomes according with syllabus guidelines and requirements in English and other key learning areas, in the course of completing a unit of work on the theme of inventions and inventors. While learning tasks and experiences within the unit of work at most approximated to “real life” social practices, the pedagogy was rich in “life like” practices and “focused learning episodes”.

### **2. *The site***

Abbotsdale is a pre-Year 7 school in Foxtton, a town located in regional Queensland that serves 15,000 urban, semi-rural, and rural inhabitants. This study focuses on a Year 5 class of 24 students—11 girls and 13 boys. Their teacher, Robert, had been teaching for 22 years, the last ten of them at Abbotsdale, admitting to enjoying his work greatly and feeling very much at home in the town. Abbotsdale has 35-40 preschoolers and 190-200 Year 1-7 students, taught by ten teachers, with the assistance of “two and a bit” paid teacher aides. Classes are a mix of single year (Years 1, 5, 6, 7) and composite (Years 2-3, 3-4, 1-7) groupings.

Robert's classroom occupies a self-contained wooden building some distance from the main block, raised on tall stumps to catch the breeze. At first sight it has an air of tradition and “old worldliness” about it, but this impression is quickly dispelled on entering the classroom. A bank of three computers with processing speeds equivalent to 486 and 586 PCUs range across the back of the room. Two are fitted with quad speed CD-ROM players, and the third is linked to the Internet via a local public provider. What looks at first like a fourth computer in a front corner of the room is, in fact, a reconditioned monitor wired to a video recorder and stereo speakers. The speakers are also connected to a “ghetto-blaster” type audio player, which is used each day by the student whose turn it is to play a favourite “single” to the class. A much-used blackboard stretches across the front of the room. Beneath the windows down one side of the room are shelves packed full of print resources. Robert's desk

is parallel to these shelves, set a metre in from them and near the back of the room. Students have their own desks, arranged in lines of six or seven, where they sit during "whole class" segments of lessons. Much of the time, however, they work in small groups inside or outside the classroom. The room has no wasted space; there is just enough room for the 24 students. There is a homely, welcoming feel to the space, and it quickly becomes apparent that all participants enjoy learning and working here.

Foxton's population is overwhelmingly Australian born. 1991 Census figures indicate that just 1.7% spoke a foreign language. Of the 7.5% of foreign born citizens, only one third were born in non English-speaking countries. 12.96% of the urban over 18 year olds registered in the workforce were unemployed in 1991, as were 10% in the adjoining semi rural area. Family incomes are uneven. In the adjoining semi rural area, from which Abbotsdale draws many of its students, 34% of the population had combined family incomes of under \$20,000 in 1991, with the largest single category (17% of the total for whom total income figures were available) being in the \$16,000-\$20,000 range. 7.5% of complete returns were for family incomes over \$60,000, and almost 3% were over \$100,000. Until 1997, Abbotsdale has received funding under a Commonwealth program for schools in low socio-economic areas.

### **3. The policy context**

#### *(a) Abbotsdale's technology policy*

Robert is the school's technology coordinator and was responsible for its Technology policy. The policy follows the national Statement on Technology for Australian Schools (Curriculum Corporation 1994c) in distinguishing between technology as "a learning area" and technology as "learning technology", referring to computer uses in classrooms.

Abbotsdale's technology policy observes the 4 strands identified in the national Statement: viz., designing, making and appraising; materials; information; and systems. Technology is not taught as a discrete subject in primary schools in the state. Abbotsdale's policy is to undertake designing, making, and appraising activities in relation to materials, information, and systems within other subject areas—e.g., specifying, gathering, sorting and analysing information needed in classroom activities (heights, news, distances, opinions, issues), recognising the impact of information on learners' lives, etc. The learning aim is to alert students to technology as a way of thinking, acting, proceeding—a form of practice—engaged by humans in all times and places, within the various spheres of their daily lives. Students should learn to think and act in "technological" ways, just as they learn to think and act from aesthetic, moral, economic, scientific, and other points of view. The school aims to provide a balance of activities across the four technology "strands".

With a teacher librarian from a neighbouring school and the region's learning technology project officer, Robert framed a careful sequence of skills and conceptual learnings designed to make optimal use of the school's learning technology resources. Concepts and skills are related within the learning sequence. Opening

files, changing fonts, manipulating graphics, and the like, are simultaneously skills and concepts. As such, they are to be acquired as far as possible within appropriate—natural and functional (Gee, 1996)—contexts.

*(b) Abbotsdale's language policy*

Abbotsdale's language policy, expressed in its English Program statement, is based closely on the state's Years 1-10 English syllabus. (See Facing the challenge sites study, this volume). Learning is based on a text-context model of language, according to which meaning is realised through purposefully constructed texts generated within functional contexts. Texts are conceived as being spoken, written, non-verbal, visual, or auditory in type. The relationship between text and context is understood in terms of cultural context and social context. All language is seen to arise within activities called genres, which are engaged at the level of cultural context. At the same time, variables arising in the social context impact on language use at the level of register. Variations occur around three aspects: "field" (which has to do with the subject matter); "tenor" (which involves roles and relationships); and "medium" (written, spoken, visual, etc.) and "mode" (e.g., film, telephone, newspaper).

Against this background, Abbotsdale identifies its language learning aims in terms of "functional" and "operational" aims. Its functional aim is to help students learn to use language effectively in order to participate as confident members of family and community, engage in further study, and take part in a range of recreational pursuits. Its operational aim is to develop students' abilities to produce and understand written and spoken English fluently, effectively, appropriately, and critically for a wide range of personal and social purposes.

The policy claims language is best developed through modelling and scaffolding, recognising individual learning styles and rates of learning, offering meaningful experiences across a range of genres, promoting positive attitudes toward language use through explicit celebration of students' language skills, valuing and building upon prior experiences and attainments, and valuing cultural, gender, class, physical, and intellectual diversity.

Three types of learning activity are to be planned in accordance with the characteristics and learning styles of the students, within three identifiable phases of language development. All types of activity and all phases of development should be taken into account and planned for in order to maximise independent control of language skills and understandings. The types of activity are called "real life", "life like", and "focused learning episodes". Real life activities involve exposure to genres and their embedded language uses in situ. Life like activities are classroom approximations to "the real thing". Focussed learning episodes involve detailed practice of specific elements of language use, such as drafting and redrafting a particular kind of text until it is produced "properly". The three phases seen as leading to independent control are an "incidental" learning phase, an "explicit" learning phase, and an "extended" learning phase. Incidental learning usually involves prior exposure to a genre and its associated text types outside the formal planned teaching and

learning setting. Classroom learning, in other words, should build on prior outside experience as far as possible. The explicit learning phase involves introductory and planned exposure to the object of learning. Extended learning will occur within and outside the planned learning setting. The teacher's role here is to help maintain the language, provide continued support, and present opportunities for extended focusing on skills and understandings.

#### **4. The practice**

##### *(a) The human participants*

Year 5 are 24 energetic and mainly outgoing 11-12 year olds (11 girls and 13 boys). There is always energy, but never disruption in this class—although the same students prove capable of putting other teachers off their stride when they go for specialist subject instruction. No one child stands out as “precociously able”, and while some seem to struggle more than others, we find no evidence of students unable to stay in touch with their learning tasks. Similarly, while some are visibly more “involved” in their learning than others, no child is significantly disengaged from the activities at hand. They come from low to lower-middle income families, with the median on the low income side. There are certainly no trappings of prosperity, let alone affluence, on display. Robert knows these students well—personally and experientially. His own social class origins, as the son of a labourer-janitor-groundsman-handyman, parallel in significant ways—albeit 30 years earlier—those of many of his students.

Robert is also very much at home with new technologies, having actively followed their evolution during the past two decades. The machines in his classroom originally had CPUs of 286 and 386. Replacing components, he has built them to 486 and 586 capacity, installed CD-ROM drives, and wired one to the Internet. He also troubleshoots other teachers' computer hassles, and oversees software acquisitions.

In a busy life revolving around a close-knit family, Robert also studies part time for his PhD, investigating the role of teachers and technologies in promoting development of higher order thinking skills in children with intellectual disabilities. In this work Robert draws on theories and research from the areas of constructivist perspectives in learning theory, development of self and beliefs about self, and principles and practices of inclusiveness, bringing them into conversation with theory and research concerning technology and computer applications in learning.

From time to time a Year 7 student, Amanda, attends class to act as a peer tutor for the Year 5 students when there are new “skills” to be learned. Amanda first enrolled at Abbotsdale in Year 2, when the school introduced an inclusion program. She had been formally assessed as “mildly to moderately intellectually disabled”. Reports indicate she found school a fearful place and withdrew—at times, to the point of total avoidance—from social interactions and many school tasks, especially those involving reading and writing. Although her reading had improved on arrival at Year 5, she still withdrew and avoided writing whenever she could, other than direct copying from

books. She did, however, show keen interest in and facility with computers. Robert built on this, designing an individualised program for Amanda aimed at enabling her to develop a repertoire of language and literacy processes, understandings, and competences while she worked on computers. Robert hoped this program would also enhance Amanda's interactional skills, confidence, and personal esteem.

Activities and "learnings" were carefully sequenced, beginning with "games" type activities to build confidence in using basic commands, running programs, and turning the computer on and off. Then came introduction to technical features of desktop publishing software via a series of intensive tutoring sessions. These were organised into manageable chunks and deflected attention away from the text being produced collaboratively by Amanda and Robert—given Amanda's fear of writing with conventional tools. These sessions introduced a range of page borders and the notion of selecting borders to express particular ideas, and moved by degrees to experiment with colours, sounds, and scanned images in Amanda's final texts. These were used to present information relevant to the class and were displayed in the classroom and about the school.

Amanda soon became recognised by her classmates as an expert in desktop publishing, and her advice and help was sought regularly by other students. Robert formalised Amanda's expertise by coaching her in a number of peer tutoring strategies and having her run "workshops" for groups of students during class time. Her ability to communicate with others, her attitude towards—and productivity in—reading, writing and viewing, speaking publicly, and her confidence in herself as a learner improved dramatically. By the end of Year 5, her reading abilities were ranked seven standard deviations above the norm for her class. When she moved to Year 6 and 7 Robert continued to use her regularly for peer tutoring work. In the "snapshots" that follow, Amanda was responsible for teaching the Year 5 students how to use the desktop publishing software to design and produce posters and invitations, and how to use a scanner to import photographic images into texts.

*(b) The non-human resources*

The main material resources employed during the unit of work were:

1. class sets of theme-based resource books on inventions and inventors, and other books held in the classroom;
2. structured printed worksheets, exercises, guidelines, etc., prepared by the teacher to guide independent and small group work;
3. the library ;
4. two 486 CPU desktop computers fitted with quad speed CD-ROM players
5. a hand-held scanner;
6. A 586 CPU desktop computer with Internet access and equipped with Netscape web browsing software;
7. a colour enabled Desk Jet printer;
8. a range of software including CD-ROMs (encyclopaedias, etc.); movie making and animation software; desk top publishing and word processing packages; graphics software; problem-solving and games-type software.



*(c) The immediate learning context*

Robert's principal strategy for embedding new technologies in classroom language and literacy education is via a theme-based approach to cross-curriculum planning. During the period in which we observed the class, they were engaged in a unit of work on "Inventions". This involved a range of projects and tasks developed within and across different learning areas: English, Mathematics, Science, Music. Exploration of this theme was grounded in a kit of commercially produced classroom resources, but Robert supplemented these with computer software programs, reference books and, increasingly, Internet resources.

In keeping with Queensland P-10 English syllabus guidelines, the students produced individual written reports on an invention or an inventor as the major outcome for the unit of work. This was assessed by Robert who had provided careful guidelines making explicit the structure and content of the report genre (according to the English syllabus), and which scaffolded production of the report. The students also gave oral presentation of their reports, using artefacts they had produced as props for their presentations. The presentations were peer assessed as well as teacher assessed, Robert taking the peer assessment into account in his final evaluation. Students had to draw on explicit knowledge of the report genre to make informed assessments; hence, this aspect too was part of the learning process.

Within the larger context of producing reports, students produced an array of texts, notably, a 2-3 minute movie, a poster advertising the movie, and an invitation to attend the movie premiere. In addition, they worked individually and in their small groups to generate a range of other texts integral to these larger productions: e.g., scripts for their movies, lists of criteria for effective posters, statements from different points of view where they looked at issues surrounding inventions and technologies from various perspectives (if this machine will increase production but eliminate jobs, how would you evaluate it from the standpoint of an employer, a displaced worker, etc?). Finally, a lot of discussion, conversation, summation, critique, and the like went on around the structured activities designed to stimulate and guide text productions.

The unit of work as a whole, then, comprised a complex array of integrated, interlocking, and interrelated text-based activities. These informed and built upon each other, culminating in the production of reports which drew upon the total range of texts produced.

*(d) The modus operandi: "rotations"*

Robert used the pedagogical device of activity rotations to handle such themes. Large chunks of time were set aside each week during which small groups (3-6 students) moved through a cycle of activities and tasks in different spatial locations. Rotation-based work involved two 90 minute segments of time divided by a break. Each 90 minute segment was broken into three 30 minute blocks. Each block was devoted to a different kind of activity, typically drawing on different communications technologies. Reading theme-related materials (sometimes aloud to a teacher aide), for practice as well as for getting information relevant to their projects, accounted for

one block. Working in groups with pen, paper, task sheets, pre-set tasks, and discussion, comprised a second block—and was often concerned with preparing ideas and components to be implemented at the computers. Work at computers made up the third block. Robert's plan was that during rotations the class would move through two complete sequences of activities, to maintain a rate of focused progress, ensure continuity, and provide integration of reading, writing, discussing, and computing activities. Following rotation sequences the class typically came together to discuss issues, problems, discoveries, etc.

*(e) Some representative “snapshots”*

Sally and Kate sit at one computer. The “Welcome” page for Microsoft's 3D Movie Maker program is playing a cheerful greeting. The girls seem unsure of how to enter the program, and their classmate, James shows them how to locate their movie file and open it. The girls play through their movie—featuring an invention—until they reach the scene on which they are currently working. They consult the script overview they had written in previous rotation sessions and begin discussing character placement, actions and speech, background music and sound effects.

James returns to his group which is sitting on the floor looking through a stack of newspapers in search of news reports on inventions. When found, the reports will be analysed according to criteria based on the English syllabus context-text model of language use, and listed on a task sheet supplied by their teacher and discussed earlier as a whole class. James and Hank argue over whether the “bubble house” described in one article is an invention or not.

Another group of students is engrossed by a software program that requires them to construct on-screen a “working” apparatus that enables a ball to travel from point A to point B. They discuss possibilities, test out their ideas, and cheer when they add a successful component to their design.

Mark, Brendan and Liam sit at the third computer, which has an Internet connection, and use a search engine to locate invention-related sites. This is the first time this group has used the Internet, and Robert has supplied them with a task sheet requiring them to fill in particular information about the web page (e.g., its location or URL, the invention showcased, etc.). The group locates a comprehensive and well designed Japanese web site presenting a range of wacky inventions, including dusters for a cat's feet so that the cat can clean your home while you're at work, a hat that incorporates a roll of toilet paper for dispensing “tissues” to people with severe colds, and the like. While reading and laughing their way through the text, they comment on some of the syntax used and discuss with Robert whether or not the writer speaks English as a second language.

During a second round of activities, a group of students is at the computer with the desktop publishing software. They are learning how to create text boxes, and insert text, graphics, and borders, in order to make posters advertising their movies, and personal invitations to attend the premiere. The trio are being introduced to the desktop features by a Year 7 student, Amanda. Amanda patiently demonstrates how

to perform needed functions, drawing on the students' existing knowledge of computing functions. Then one student sits at the computer, mastering the routines while aiming for the textual effects desired—with suggestions from the others on choice of fonts, borders, etc., and technical responses from Amanda when requested.

*(f) Learning through technologies.*

Robert's classroom practices are a mix of conventional—even quite traditional—and innovative, technologised approaches to teaching and learning. For example, the traditional “morning news” session is still very much in evidence in this classroom, as is the longstanding practice of students delivering ‘lecturettes” (now delivered as an “oral report” to bring it into line with the content scope of the Queensland English syllabus). In addition to rotation sessions, Robert uses a variety of class grouping strategies (e.g., whole class, partners, large group, etc.) and content delivery strategies (e.g., organising for a local astronomer to set up his powerful telescope one night at school and inviting students and their parents along to participate).

While students clearly learn about technology in this class, greatest emphasis is placed on learning through or by means of the technologies available to them. This holds especially for aspects of language and literacy education in the class. 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 but, rather, that they be used to maximise learning and students' practice of “higher order skills”. For example, while talking about the benefits of having Internet access in the classroom, Robert focuses on the time freed up by Internet research compared with time spent searching manually in local libraries. This extra time, in his opinion, can be used to develop students' report writing and information handling skills and processes, rather than squandered in the often laborious process of locating and collecting information from more conventional sources (e.g., school and local libraries, etc.). These skills and processes include evaluating the information gathered, synthesising data gathered from different sites, thinking about social implications and issues related to the area of investigation, extracting relevant data and working it into a particular genre for a particular purpose (e.g., an oral presentation to peers, etc.), then working on a computer to draft and polish the final text.

To meet English syllabus requirements, 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—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. In terms of making the genre of these text types explicit to students, Robert asks each group questions such as, “What else will you need on the poster if it's telling people about the movie?”, rather than simply telling students the conventional structures and content of the text. Such questions encourage students to think explicitly about the purpose of the text they are constructing and the audience for whom it is intended. Although no actual samples of movie posters seemed to be available within the classroom, movie-going or video watching is a popular pursuit in

Foxton. In this set of activities, Robert clearly expected students to draw on their understandings of the real-life social and textual practices associated with movies.

The final posters for the students' animated movies suggested most students were able to produce texts providing enough information about the movie to stimulate interest. They included eye-catching and thematically appropriate graphics, were well set out and were highly readable. The posters were all distinctive, bearing the stamp of their creators. The students were proud of these posters and of the choices of language and images they had used by deliberate design "to get people in" (Mark discussing the poster for his group's movie, "Mr Mad Invents a Cab"). Here the desktop publishing program clearly took a back seat to teacher and students focusing on the poster text, its purpose, and the social practices with which it is associated out-of-school.

Interestingly, there were no wall charts of technology-related instructions listing the steps to follow in creating, saving, opening files, how to import and edit graphics, or how to use different fonts effectively. Indeed, Robert has much to say against lessons that focus on technology at the expense of learning, creativity and exploration, and has ensured that the school's technology policy explicitly steers teachers away from lessons comprising "how to make a file" or "this is how you use the mouse". This is not to say, however, that students are not taught about technology in his class. Nevertheless, technical sessions are deeply enmeshed within larger, more meaningful practices in the classroom—Amanda providing an elaborate case in point.

## **5. Distinctive features of the practice**

### *(a) Theory and practice*

Practices in this Year 5 classroom were characterised by an emphasis on learning through technologies whilst learning about technologies. The pedagogy was strongly informed by theory. A mix of conventional—traditional, even—and innovative approaches to teaching and learning were employed to integrate use of computer technology into activities in a manner which was as "invisible" and seamless as possible. Classroom activities were scaffolded in a variety of ways. Some employed questions prompting students to reflect individually or in groups on a process or tool and/or to evaluate it (e.g., a piece of software, a reference book). Others employed guide sheets assisting students to work from cognitively simple knowledge (e.g., through literal content questions) to more complex understandings (e.g., through questions requiring students to evaluate, extrapolate, analyse and/or synthesise content and processes). These ways enacted Robert's constructivist theories of learning, and presented opportunities to experiment, explore, play, take risks, and solve problems using resources of more conventional and new technologies.

### *(b) Motivation and independence: the logic of scaffolds*

Discussing effective language and literacy teaching strategies, Robert emphasised the role of the teacher in helping students to become motivated and independent

learners. “Scaffolding” is a key concept in Robert's talk about his approach to teaching. His conception and practice of scaffolding enriches the “teaching-learning” model championed in the Queensland English syllabus. The syllabus promotes demonstration, modelling, the provision of opportunities for collaborative and—later— independent work, and the like. Robert keeps learning outcomes to the fore and provides students with carefully sequenced tasks that repeatedly build on the already known, yet also include aspects of “higher level tasks” in ways that stretch and challenge the students' abilities to complete increasingly more sophisticated tasks (cf. Vygotsky's zone of proximal development, Lave & Wenger, 1991; Anderson, 1995, p. 19). In this way, Robert adds a cognitive dimension to the teaching-learning process that may well be underplayed in the English syllabus.

*(c) A pedagogy of questioning*

Robert actively cultivates a culture of enquiry, exploration and self-evaluation, encouraging students to be(come) self-motivated and successful learners. He explains his approach and emphases in terms of social constructivist theories of learning. Robert's theory of learning is especially evident in his “pedagogy of questioning”, where he scaffolds student learning through the questions he asks: questions which evoke responses requiring students to build on what they already know by means of extrapolation, synthesis, prediction, deduction, and so on. Robert bolsters this pedagogy of questioning with overt expectation that students will be self-directed learners, increasingly independent of their teacher yet able to work collaboratively with peers.

*(d) Meta matters*

In all of this Robert focuses on developing students' meta-level understandings of problem-solving processes and strategies. Work using 3-D Movie Maker software is accompanied by task sheets requiring students to list and consider factors involved in producing an animated movie; reflecting on the various “plus”, “minus”, and “interesting” things encountered while making the movie; describing ways the group solved specific problems; etc. This evaluative and analytic work extends to wider uses of technologies inside and outside classrooms. “Point of view” exercises invite students to analyse and discuss the impact of technologies on consumption and employment. In addition, as noted above, students are required to evaluate their own and others' work with recourse to criteria sheets and checklists developed and compiled in class. These lists also, of course, serve as scaffolds for completing other teacher-set and self-directed tasks. In many ways the P-10 English syllabus in Queensland aims precisely at promoting the kind of meta-level processes and understandings Robert addresses in his pedagogy.

*(e) A community of learners*

The English syllabus advocates development of a classroom culture that enlists teacher(s) and students (and other participants) as members of “a community of learners” (DEQ, 1994a; Freebody, 1992). Robert's Year 5 class is by no means a grass-roots youth organisation. It operates within institutional constraints not

necessarily present within the youth group settings investigated by Heath and McLaughlin (1994, p. 472), or in the contexts researched by Rogoff (1990; 1995). Nonetheless, “apprenticeship” or “learning to learn” work done within these original group learning contexts usefully informs our understanding of Year 5. Robert's students are not just learning content but, rather, are “learning for anything”. His classroom operates more like a community of learners engaged in purposeful sociocultural activity than a class of individual students following individual, teacher-directed learning paths.

Communities of learners share contexts and purposes for learning. For Robert, computer technologies in the classroom provide “new” contexts for learning. Students work collaboratively on computer-based tasks, negotiating how they will complete the task, discussing problems encountered, and generally seeming to respect each team member's contributions to group and whole class activities. Students are involved directly in learning from each other: through peer tutoring, negotiating task requirements, discussing and solving problems, and peer evaluation processes. Robert disavows “transmission” approaches to teaching and learning.

“Well, instead of, say, having a unit of work where you stand out the front and tell students the content and they either memorise it or complete activities or complete drill and practise software in that area, [I was attracted to the idea] of thinking about what students' interests were, and what their skill level was, and then to provide them with opportunities to explore the areas of knowledge that the units covered. As well as that, [it's important] to provide tasks that students could see would be worthwhile and to give some sort of scaffolding in the form of genres and processes that they can use. I found especially useful that idea that you just can't say to them, “Well, we're going to investigate Leonardo da Vinci and then let them get on with it”. (Robert, interview)

The learning tasks encountered daily in Year 5 also involve students with varying degrees of expertise in collaboratively negotiating task requirements, solving problems, and producing worthwhile outcomes (mostly within the boundaries of the classroom). Furthermore, the ways new technologies are used in class provide Abbotsdale learners with contexts and opportunities for “mature participation” in a range of useful processes and activities with real world applications (Rogoff 1995, p. 142). The adult-level software used daily in class ranged from Microsoft Publisher, which is used by countless numbers of small businesses and community groups to present and disseminate information, to Microsoft's 3-D Movie Maker, which requires sophisticated understandings of visual narratives, fluency in manipulating available program functions, and fine-tuned dexterity with the keyboard and mouse. Beyond mastering performative aspects, Robert's students were expected also to explore the capabilities of each software program and to share new knowledge or hints with classmates.

*(f) Authenticity*

With respect to “authenticity”, few “real life” experiences or outcomes were observed in class. There were, however, plenty of connections between the tasks engaged in class and students' everyday lives, funds of knowledge and interests (cf. Moll 1992).

((Discussing which actor to choose for the next scene in their animated movie))  
Mark Yeah, but which man. Now, what was that other man that we had?  
Brent Uhm, I'll get the script  
Mark Oh well, she'll be right, we'll just find the people while we go  
Leon Just Steven? ((Pointing to an "actor" in the palette of options))  
Brent Yeah, "Steven Spielberg"  
Mark ((To researcher)) We called him Steven Spielberg because he looks like him.  
Yeah okay, I think you'd better change the clothes a bit, don'tya think Brent?  
Brent ((laughs))  
Mark He looks like a bit of a nerd

Like many school projects, the animated movie production is not a "real-life" activity, in that students did not prepare their movies for an audience beyond the class. Even so, this activity is "life-like" and builds purposefully on students' experiences out of school, providing them with a platform for considering genres and social practices associated with making movies. One student explained that working with the animation software was not simply about learning how to use the software. Rather, it was like learning how to make movies like "professionals" do. Even if his analysis of movie making is somewhat oversimplified, the way he talked with his team mates, discussed options, and maintained a storyline of sorts using speech, images, movement and props, suggests he was making connections between his own movie and his understandings and experiences of "real" movies and Hollywood.

*(g) Apprenticeship and guided participation*

In this classroom the roles of teacher, learner and collaborator were never static or fixed. At times Robert spends a lesson or two teaching a particular concept (e.g., news report genre, graphing) to students. At other times these concepts and processes become "reference points"—particularly, when introducing new software is concerned. Students use each other as learning resources—exemplified by Amanda and the Year 5 students and, for example, when Sandra shows James how to access a particular inventor on the CD-ROM, or Andrea and Kathryn are overheard discussing how Jack could have improved his oral report presentation. There are strong resonances of Rogoff's description of apprenticeship, with participants moving through cycles of activity, teaching and practice (cf. Rogoff, 1995, p. 143).

Likewise, guided participation appears to be an organic component of the teaching-learning process here. Support for learning takes a variety of forms, including networks of interactions occurring around each activity. We observed very little whole class work in Robert's classroom. Students generally worked in pairs or small groups, discussing, arguing, negotiating solutions to problems, evaluating strategies and outcomes, tabling information they had located and the like. This was especially evident in computer-mediated text production.

Once students appeared to have mastered the basic concepts or components of a process, task or genre, they were encouraged to experiment with it and explore how it

could be changed in ways that made it more effective for a particular purpose. For example, after introducing students to the conventional generic structure and linguistic features of biographies—in keeping with English syllabus guidelines, Robert provided them with a range of printed and digital biographies and opportunities so they could play with the genre. While some students appeared to prefer conventional approaches to biography writing, others chose to blur genres (e.g., diary biographies) or experiment with narrating from different points of view, and so on.

Robert's practice of providing students with reference guides or sets of open-ended questions that help them structure their approach to completing a given task can also be seen in terms of guided participation. Robert produced a booklet that guided students through the process of researching and presenting an information report, a set of worksheets that asked students to analyse a task or activity (e.g., the “Plus, Minus and Interesting things” and “Consider all Factors” response sheets described earlier).

## **6. Issues and implications**

The Abbotsdale case illustrates five key issues, each having related implications for classroom based learning, which in turn point towards principles and recommendations. These issues are: the relationship between theory and practice; the potential for fragility within the site; planning and programming links; the relationship between classroom purposes and technology purchases; possibilities for operating as a community of learners within school settings. We will deal with these briefly in turn.

Abbotsdale highlights the value of teachers informing their practice with mature and cogent theory. It is, we believe, no coincidence that Robert has been able to draw on the litany of approaches to language and literacy education that have flecked the Queensland primary education scene over the past two decades and integrate them into a coherent practice. He is, in fact, a teacher-researcher and a researcher-teacher: currently doing his PhD part time, subjecting his own classroom pedagogy to rigorous theorised scrutiny. At a time when teachers in the state are faced with a complicated hybridised English syllabus, much of which is informed by complex theory, saddled with ever-escalating assessment and reporting demands, and where the profession is beleaguered by widespread charges of failing to perform its role adequately, Robert never appeared pressured in his work.

Teachers are better placed to integrate technologies into classroom learning when they are well informed theoretically about pedagogy (including, how people learn), technology, and literacy issues. Robert's technological expertise at the operational level was augmented by his theoretical perspective on learning, as well as his theoretical understanding of social applications of new technologies. The clear implication here is that preparing teachers within preservice and inservice initiatives to integrate new technologies effectively into classroom pedagogy involves much more than merely “skilling them up”. What is needed are extended opportunities to make explicit and concrete the connections between theories and practice, such that living one's theory in practice and theorising one's theories becomes an organic



unselfconscious part of one's pedagogical practice. In part this requires breaking down conceptions of teachers as "just practitioners". In addition, however, it means buying out of "recipeed quick fix" approaches to professional development, and ensuring that theoretical development is always tackled as close as possible to points of application, by offering teachers theoretical options to try on within the immediate practical contexts.

Robert's work also benefits from his grounded familiarity with computer technologies. He has been around computers for a long time and understands their "logic". 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 and Lankshear, 1996) in which new technologies are organically embedded and deployed.

Robert's personal expertise and his status as key player in the technology side of Abbotsdale's life raises the issue of "fragility". What would happen if he was suddenly to leave? Would the machines continue to be maintained? Would other teachers have access to onsite competence when machines went down? Who could other teachers turn to for advice? The issue of fragility underscores the importance of whole school approaches to developing competence.

Our observations did not extend far enough to determine exactly how far this was a pressing issue at Abbotsdale, but it is well known to be a general concern within Australian schools. What we *can* say is that Robert recognised this issue very well and that he was involved at the time in developing a project with a cluster of disadvantaged schools in the region to build "from the ground up" a range of new technology based learning initiatives within which participants could develop and share their expertise. This project is ongoing, with a web site and an array of online resources in place, and a program operating where participants meet regularly to work together. This project operates on a multiplier effects basis and will undoubtedly produce benefits among the participating schools.

The third issue concerns the relationship between planning and programming. Abbotsdale students benefit from the fact that the school's technology policy is coherent, comprehensive, and integrated with other policies—notably its language policy. As one of the main architects of the technology policy, Robert has been able to inform it not only with a mature theory of learning generally, but with a sophisticated understanding of language and literacy-related learning more specifically. He would be a highly competent language and literacy educator in the context of any technology. But, positioned as he is in relation to computer-based technologies, he is able to enhance his language and literacy teaching with informed technological expertise, just as he can enhance his technology-related teaching by coupling it to a sound approach to building language across the curriculum.

This concept of developing programming closely in relation to planning works well in this classroom and, assuming roughly equal competence across the staff, would work well at the whole school level. Part of what makes it work at Abbotsdale is that each teacher has a circumscribed range of operational competencies to develop among students and these are arranged in a logical sequence. This makes it possible to give focused attention to the cultural and critical dimensions of using new technologies within literacy practices, since the teacher is freed from having to teach any or every thing at the operational level. The implication here is that in-school planning and policy development within language/literacy and technology should occur at the whole school level and in an integrated way. Ideally this should be a whole staff activity as far as possible. This would encourage “reflexivity”: i.e., technology and literacy policies and programs can mutually inform each other and draw upon the understandings and expertise of all who would be involved. Seen in this way, program and planning development across subject areas and grade levels can become a built in aspect of professional development and renewal.

Continuity is an important principle in planning and programming and is evident in Robert’s classroom. Robert practises sound principles of incremental change and building on proven foundations. When a unit of work “works” effectively, he adds to it rather than moving on to largely new approaches. He says that the inventions unit works well for him, and so he will add new content to its basic format in the years ahead—keeping an eye to student interests and experiences; holding the “core” intact, but making enough modifications to keep students engaged and to maintain his own interest. His social constructivist view of learning keeps him sensitive to the individuality of students, and alert to the demands of maintaining challenging and rewarding learning environments (DEQ, 1994b).

The fourth issue concerns the relationship between classroom purposes and technology purchases. There was no wasteful or duplicating purchase of hardware and software at Abbotsdale. Close integrated programming meant that specialist applications, e.g. Internet connections etc., were concentrated at particular points in the whole school program. The assurance was that by the time students graduated from Year 7, they would have covered the broad gamut of operational aspects. Tailoring scope and sequence within the technology policy and planning to scope and sequence within the English program (and vice versa) enabled the development of clear literacy education purposes within Robert’s curriculum. These purposes were addressed by a tight match between classroom language and technology resources. The implication here is that the more clear and systematic a school can become about its related language and technology purposes the easier it is to make intelligent and cost effective resourcing decisions.

The final issue points to possibilities for and advantages of operating as a community of learners within school settings. As described above, the principle of sharing expertise produced multiplier effects in learning. This involved teacher student exchanges, student to student exchanges, and outsider to insider exchanges. The latter involved outsiders from both outside the school (the technology and language advisers) and outside Robert’s classroom (Amanda). Developing a community of learners in the Abbotsdale classroom had implications for the quality of learning, and

the realisation of important educational values which are often espoused but less often apparent—e.g., enhancing self esteem, increasing motivation, practising collaboration and cooperation.

## **BUSHNET SCHOOLS—UNEVEN POTENTIAL**

### **1. *The site at a glance***

This “site” is unusual in being less geographically bounded than our other case studies. As a wide area network it links up more than twenty schools “scattered across 6000 square kilometres of Far North Queensland from the rainforest at Julatten to the dry bushlands of Chillagoe. . . . The BushNet schools range in size from Irvinebank with a single teacher-principal . . . [To] Mareeba State School with more than 600 students” (<http://www.bushnet.qld.edu.au/schools/htm>).

The network not only links up schools to one another; it also provides a web site for the schools’ home pages and associated pages and access to the Internet. Nonetheless, it is difficult to discuss BushNet as “a” site; policies and practices relating to education are still developed within individual schools, and there are marked differences between one school and another and between one classroom and another within the same school. For reasons explored below, this unevenness, and the fragility of many of the most exemplary practices, are an issue whose implications need further examination.

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

### **2. *The sites***

#### *BushNet*

BushNet began with a vision shared by three individuals with an enthusiasm for the educational potential of online information and communication. Alan Winlaw (previously a teacher at Herberton Primary) had knowledge of the state school system and whose doors to knock on, and the persistence to pursue people for funding. He worked with Guy Carpenter, a CSIRO employee (the organisation originally provided BushNet’s access to the Internet), who prepared the feasibility study and eventually set up the hardware. Jerry Jeffress, an Academy Award winning self-styled “special effects wizard” who had dropped out of Hollywood, worked at Herberton Primary School with a computer club and got caught up in the project as an enthusiast. The three took their “Internet Roadshow” around the schools of the area, demonstrating the potential of online technologies, including Netscape and a MOO. They persuaded the schools to band together and in 1995 successfully applied for sufficient funds (\$70,000) from the federal Priority Country Area Program to set up the basic infrastructural hardware. (The Queensland Education Department has not provided any funds for BushNet, although individual schools have purchased electronic equipment from their Department-sourced budgets.) As one of the most enthusiastic teachers noted,

“The Department are getting a lot out of us for free [as she and others try to provide support for novice teachers], and I think it’s about time that they gave us a hand. . . . The department knows they’re valuable [technological skills], so

they should start giving the time [by providing funding for teacher release in peer tutoring and the like—an issue taken up in Section 6 below]."

Most BushNet schools have a single modem and dial-in Internet access—though Atherton High School has sixty machines linked up to the net. What use individual schools make of the connection is at their discretion. Some, like Mareeba State School, have “taken the BushNet ball and run with it”, as the Deputy Principal there, Lloyd Perkins, notes. Others have done little if anything.

#### *Mareeba State School*

The school is large for the region, with approximately 700 students, a high proportion of whom are Aboriginal and Torres Strait Islander. It is classified as a disadvantaged school for socio-economic and geographically isolated reasons. Its home page provides the following information about its community:

Our students and staff come from a variety of cultural groups, including Australian Aboriginal, Strait Islander, Anglo-Celtic, and Southern European. A significant number of our students are itinerant. The community is presently recognised by the State Government as having special needs due to difficulties associated with rural readjustment (Tobacco Industry). . . .

It also announces:

#### Technology in Our Classrooms

Our school boasts up to date electronic technology in classrooms and administrative areas. Internet access through BushNet enhances the resource collection of our library.

Staff utilise technology in the provision of equally diverse curriculum offerings to cater for the individual needs and differences of the students. This curriculum is based upon educationally sound principles of effective learning and teaching.

However, the Deputy Principal concedes that in practice there are great unevennesses from one classroom to another. Some individual teachers make creative use of the technologies, and try to share them with others—but the uptake of such invitations varies. Some focus on word processing, others on the use of information via online technologies. The web is slowly becoming a part of some classrooms and curricula—as much as the relative paucity of computers permits. This is opening up communication with local (Aboriginal) and global (school) communities.

As in many schools, the path to accumulating and upgrading computers is always uphill. In this case it is also marked by improvisation. For example, Lloyd Perkins [LP] and Guy Carpenter cobbled together some old bits of hardware to make a router, to enable greater access than when they had just one Macintosh with the school's single connection in the library. The work load has increased for LP too in supporting teachers when their computers have problems, some of whom have a permanent dependence on him as a fix-it man—while others are prepared to sit down alongside him and learn how to fix their own problems, or take advice and have a go.

In another instance of improvisation, the teacher who was followed in this site, Heather Greder, has obtained permission from the local Aboriginal Student Support and Parent Awareness Committee to use their computer in her classroom when the

community don't need it; in exchange she has helped them put up their web page. Heather claims that this situation "is putting it [the technology] in its place: we can't go overboard." She has also organised to take her students and their parents to the nearby high school computer lab to enable them to get their home pages up on the web: the parents will do the typing and will learn about the technologies on which the students are more expert. In this way again, a paucity of resources has been resourcefully circumvented by using community help.

#### *Herberton State School—Primary Department*

The school's 180 students are housed in new buildings, many of the classrooms equipped with a stand-alone Macintosh. In the library is a computer room of eight networked Macintoshes, one of them linked to the Internet. But there is no expert in computing resident at the school. A teacher aide is being trained as a system administrator, and the library staff have reluctantly got involved, to the point where according to the librarian they spend more than half their time on computing support.

It is in the computer room and in the Learning Support Unit with its additional computer that the work of developing the Etracks project (described below) has been carried out, with its web pages documenting collaborative projects developed and shared by students world wide.

#### *Herberton State School—Secondary Department (Years 8 - 10)*

The secondary department has remained on the original primary school site, with its old two-storeyed wooden buildings, after the latter's shift to a new campus in 1994. This section of the school comprises about 80 students, a significant proportion of whom come from the Gulf of Carpentaria and Cape York communities and properties as well as Papua New Guinea and the Torres Strait Islands. Numbers of local students at the school have continued to increase, despite the closure of railways, tin mining and forestry industries, with consequent socio-economic depression of the community; the breadwinners of many families commute to nearby towns.

Data about the school's information technology infrastructure (primary and secondary campuses) can be found following the links from their home page to the School of the Future Project.

The school's computer teacher and his technical assistant have used very standard equipment, in a computer lab of twenty networked IBM compatible PCs connected to a file server. Only one of these is attached to the Internet. Nevertheless with the available resources and the teachers' help the students have won two prizes for their online magazine.

### **3. Policy context**

#### *BushNet*

The Bushnet schools are scattered across 6,000 square kilometres of Far North Queensland Australia, from the rainforest at Julatten to the dry bushlands of Chillagoe, home of the famous Chillagoe Caves. The BushNet schools range in size

from Irvinebank with a single teacher-principal and eight students to Mareeba State School with more than 600 students.

#### *Mareeba Primary*

The school is currently developing a draft technology policy, based on a framework and principles developed by the Technology Adviser for the region.

The Queensland English Syllabus (see Abbotsdale and Facing the challenge site studies, this volume, for more details) provides the umbrella policy within which a literacy curriculum is developed by individual teachers for their classes.

#### *Herberton State School—Primary and Secondary Departments*

The School of the Future Project, presented via the school's home page, details a coherent strategic plan for both primary and secondary departments. This entails a staged implementation of technology resources including access to the Internet, and the skilling of staff and students with appropriate skills in the uses of computers and information technologies. The planned outcomes are to integrate technologies within a “curriculum that is relevant and stimulating in equipping students for their future” and so to “broaden the students’ perspective from that of a local to a global perspective”.

The development and implementation of curricula within subject areas are informed by the relevant Education Department syllabuses.

### **4. The practice**

The three BushNet schools showed a wide range of uses of computers for literacy learning. I have focused on those which are most distinctive and common to this site: online technologies. Here too, even in the selected snapshots, diversity is apparent.

#### *Mareeba State School: Senior A Classroom*

In this multi-age classroom (Years 4, 5, 6) the teacher, Heather Greder, regularly shares in team teaching with Robyn Grigg (Extension and Enrichment) and Sarah Clutterbuck (Special Education Unit). The classroom has somewhat battered cream walls and clean but tired brown carpet. An adjoining room gives extra space, and in that is a computer with CD-ROM and Internet link. In the main classroom is a laptop borrowed from the LOTE staff, used for playing maths games; and an Aboriginal boy with cerebral palsy has a specially adapted computer with printer which he uses with great facility, using his one functioning hand.

#### *Snapshot 1*

Before morning school a number of children—Aboriginal, Caucasian—are socialising with their teacher and one another. In the adjoining room two Year 6 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 across the desert heart of Australia. The two 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 towards the class computer fund. (They had to estimate the arrival time of the first three place getters—and incidentally

learned quite a lot about averages as they managed the complicated calculations.) The web site tells them that the first cars have got to a certain checkpoint; but there is no map on the site to show where that place is. (Later that morning, the Year 6 students would pull out the older technology of an atlas and track it down: a cattle station just over the border in South Australia.)

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. Heather suggests that one of the girls, Breanna, could either phone the manager of the web page or email him at the address given. Seeming pretty matter of fact about it, Breanna decides to write, and with Heather's help fixes on a subject title that will catch his attention: "Anxious student". Typing rather laboriously with two fingers of each hand, she composes the following, without help. (She rehearses a phrase or two aloud before keying it in or when part way through a sentence.)

Dear Mr Silver,

My name is Breanna Bailey. I'm a student at Mareeba State School. My class is a multi-aged class with Years 4, 5 and 6. We have entered your solar race competition. I was trying to find the first three place getters and the first car's arrival time but I couldn't find the results on the web site. Could you help us find the page with the results on it or could you email us with the results. My address is [email address].

Thank you  
Breanna

(Incidentally, in a later email to me, Heather noted that one of the students *had* won the Solar Car Competition. "After consultation with the Deputy, he agreed to buy computer software and technology equipment for the school with *his* prize. . . . The class learned a hard lesson about competition versus cooperation, and the realities of student empowerment in a hierarchical system.")

#### *Commentary on Shapshot 1*

In following the (solar car) leaders the students are participating doubly in a culture of competition—the race, and their own contest. And it is doubly technologised, as a web site about solar powered cars. What lessons might the students be learning unconsciously by means of this "teaching technology"? Among other things, perhaps that up to date, immediately accessible facts are valuable in an information economy. That the latest technologies (solar cars, the web) are worth attention and celebration. That the kind of data that matter in this case concern car specifications, average kilometers per hour and so on. That speed is unquestionably praiseworthy. In such ways these students are being apprenticed to a technologised culture, and they are certainly eager participants: keen to win, keen to check how their calculations measure up to the "reality" they know only by this and other forms of electronic mediation.

Breanna's pursuit of information is an interesting snapshot of a literacy practice in a changing world. It is a social practice—a communication with an unknown adult beyond the classroom walls. Breanna takes this in her stride, despite being only



eleven. And it is a cultural practice: she knows the genre of a formal letter to a stranger—although of course in other circumstances the immediacy of email is changing the genre to something more informal, closer to talk. Breanna is learning how to take her place in this wider society with its techno-cultural ways of getting things done with words and data. She is becoming a member of a community of practice around technology and literacy—and this is also a matter of politics. Consider the power this child has relative to adults: the technology does have the effect of flattening out some hierarchies by providing easier access to those at the top. And consider the power this child has relative to her peers in other classrooms who are not being so apprenticed to this practice.

As a piquant postscript let us follow Breanna back into the main classroom after sending her email. Here Heather 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” (as the jacket puts it) as the “enigmatic” philosopher Knox undertakes the education of a fourteen year old Sophie. Heather is feeding it to the class in digestible mouthfuls and setting the students to write their thoughts in response to selected statements. Breanna is just in time to hear a philosopher warning about the limits of our knowledge and proposing a becoming humility as the proper response, rather than an arrogant or confident expectation that all information is our right.

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 philosopher's argument, wisdom is presented as an internalised belief in the boundaries of our understanding. (This philosophy is a kind of moral technology, in that its practice works to shape people's subjectivities.) Such divergences—not of course articulated as such—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.

### *Snapshot 2*

To complement this sketch of students engaging with a ready made electronic document, the following episode, from the afternoon of that first day, shows the class preparing to publish on the web. Sarah Clutterbuck, a computing enthusiast, is revising with the Year 6 students the html tags for the home page each is preparing. She uses chalk on blackboard and the students copy the codes down on paper as she talks their logic through with the class. Her enthusiasm is infectious: all are attentive and several students plead with her (“Please!”) when she offers to teach them some new codes, e.g. how to put in background colour. She tells them only about white; for other colours Sarah shows them how to search for themselves, going to View then to Source in existing web pages. She goes on to teach them how to size images to incorporate. (While Sarah is chalking up the tags, three students with literacy difficulties are working on the verandah with Robyn. They are labouring to write with pencil on paper self-descriptions for their web pages. “My name is Larry and I am 12 years old . . .” one writes with tedious difficulty and massive support from the teacher.)

The reason for this talk and chalk step in the process of home page construction is that the primary school does not have a lab of Internetworked computers. As noted

earlier, the lab at the neighbouring secondary school has been booked for a future evening, to enable the students to get up their pages: they will involve their parents in typing in copy and will instruct them in inserting the tags and so take on the role of experts and teachers of their parents. Heather is making a virtue of this necessity here—enrolling the parents as teacher aides in what she could not manage alone. It may also have the advantage of making some parents—especially those who are not from professional backgrounds—more appreciative of information technologies.

### *Commentary on Snapshot 2*

It is exemplary that Sarah and Heather are keen to ensure that the students can do their own preparation of documents for the web so that they are not dependent on human experts or web editors. Nonetheless it is easy to identify the ironies in this vignette of students' learning to use an electronic programming metalanguage. Because of limited access, the old literacy technologies (chalk, pencils) here persist as the means of instruction in the new. That is, the students are still "doing it by the book"—writing instructions on paper for writing instructions for the computer. They are thus at this stage doubly dependent on the authority of the teacher's written word. Especially in these circumstances it is commendable that the learners are being given the means to become more independent by being shown how to discover the codes for themselves. (But theirs is a double advantage over those students with literacy difficulties, who are—necessarily?—out on the verandah—on the margins.)

It should be added that Sarah Clutterbuck as a Special Education teacher has long seen the potential in the web for circulating her ideas about art in the classroom for special students, and publishing examples of their work—without going through the hoops of formal publication. Her home page has links to her special needs resources page ("a collection of art and craft activities, cooking ideas, Intellikeys Overlays, software reviews and strategies, thematic ideas, and a few select links") and to her primary computer project pages ("a selection of best teaching practices, strategies and projects for the use of computers in the primary classroom") ([http://www.bushnet.qld.edu.au/%7Esarah/spec\\_ed/](http://www.bushnet.qld.edu.au/%7Esarah/spec_ed/))

### *Literacy Learning and Computers across the Curriculum*

In any day in this classroom there is a flow of activities from one curriculum area and task to another, unobtrusively set in motion by Heather, with the groups sometimes working together as a whole class, sometimes in their year level sets, sometimes in interest or project teams. At times students may be sharing the diaries they are writing for their email Travel Buddies in Canada or composing a newspaper report for the local newspaper on their Travel Buddy scheme. Simultaneously in the main classroom, another student is using the laptop for a maths game, *Outnumbered!* Soon it is recorder playing time, with each year level taking a turn for their memorised tune. (Steven, the Aboriginal boy with cerebral palsy, now arrives after doing work with Sarah in the Special Education Unit. He crawls on hands and belly under his table and across the carpet to plug in his computer. As the recorders play on he opens a solitaire game.) At the same time a boy has been asked by Heather to show a girl who has never played it how to play *Outnumbered!* He instructs her, in part doing it for her; later she plays it under his watchful eye and occasional advice. Science soon follows. Students are to choose a book from those Heather has selected from the library; they are to select, adapt or devise an experiment to carry out

and then present and report on to the class. They may also search the Internet as well for possible experiments.

The computer is on loan and may be accessed at any time by the Aboriginal community who have prior right to it as the owners. Indeed, during my observations one afternoon an Aboriginal young woman, Ciana, came in to use the computer, preparing to put some of her art work up on the community web page. Given this shared access, as Heather explained, she cannot plan it in as part of her day—"it's got to be a piece of furniture that the kids can use" without their building up a dependence on it." This is an interesting claim for the value of enforced non-dependence. In my observation, however, very appropriate, varied and constant use is made of the computer when it is available. And it could also be argued that collaboration with the Aboriginal community is a further, mutual benefit. Heather added that in her belief "the most important thing is that the technology doesn't drive the kids; the kids drive the technology". She contrasted this with situations (particularly in high school, where she has taught) where a good idea has been applied to a whole classroom of students, though it may not be appropriate to all at that time, in that way, for that duration.

### *Three Students Learning Literacy with Computers*

#### Stephen

Stephen is an Aboriginal student with cerebral palsy. According to Heather, "he can think much better on the screen because . . . he's so inhibited by the strain [of his paralysis] that he just can't think any more, but on there [the computer] he's fine: he just goes for his life. He does everything: his tables, spelling, everything". Yet previously "he was scoring below 1 [on the Stanine measures]. . . . He was not spelling, he was not writing. . . . He's a gifted artist and he was not even drawing. . . . But within days of getting the computer he went from 1 to 3. By the interview [for ascertainment] he'll be up to 4, 5 or 6. He's doing his tests on the computer. He's got a one-handed typing program, so he types quite efficiently with one hand."

#### Jessica

In Year 6, Jessica could not spell or write at all accurately, although she could read (below her year level average standard). Her mother at work in Cairns had access to the Internet, and so, with Heather's intervention, began an email correspondence. "Every morning she [Jessica] would come in [and access her email], and I wouldn't help her with her spelling. She had to be able to write a message to her mother without any help from anybody and she couldn't use a dictionary and her mother had to be able to understand it." Her mother would reply to her message, mentioning that she was unable to understand a particular word—so could Jessica please change it because it wasn't in grown-up spelling. Jessica had to read the message and plan her reply—sometimes after printing out and working at her desk. "And that changed her around. She just couldn't read; she'd never read a novel; and now she reads novels. That was email, nothing else. I did no other remediation and used no other techniques with her." What made the difference was "being able to have immediate feedback and be able to talk to mum on the email." According to Heather, in the previous year Jessica had scored only 5/100 in a spellathon. This year her score was 52/100.

Heather perceives that the strong interpersonal element and the immediate feedback from mother was very motivating, and the friendly focus on spelling encouraged Jessica to lift her game. Perhaps she was also learning a lesson that in real life, communication also requires comprehensibility.

Heather

This Year 6 student had no confidence in her writing because of her fear of misspelling words, so her teacher encouraged her to join conversations on BushMOO. There she saw secondary students with poor spelling, "and she just thought, 'Well, you don't have to spell on the MOO. Who cares? There's no teachers there to look at you.'" The secondary students would joke, "Give me another one, Curlew" or "Shocking typist like me, eh Curlew?" So the girl learned to be less fearful of writing and now writes perfectly well.

(It would be possible to see in these examples a technologically mediated contrivance: the use of a technology—the means—to enhance literacy skills—the end—relating to correctness. But it might be also that here these two girls, in complementary ways, are learning about literacy as a social—interpersonal—practice which entails adhering to, or ignoring, certain literacy conventions of orthography in particular situations. Certainly the teacher is utilising the socially interactive aspects of computing variously and appropriately, according to the students' literacy needs: to monitor or be freed from monitoring spelling.)

*Herberton State School—Primary: Etracks and Learning Support*

*Etracks—"Showing Where the People Have Been"*

An increasing number of teachers are making use of the Internet to link their students with others across the world in ready made projects like the Solar Car Challenge, many of which are educationally valuable. Fewer teachers have so far produced "home grown" projects—although, as the next snapshots indicate, these do have advantages for their students. Herberton Primary School has an online project called "Etracks"—electronic tracks; its logo is "showing where the people have been" and its rationale is that "communicating globally empowers a community locally" (<http://www.bushnet.qld.edu.au/~melissa/etracks>).

This was the brain child of Jerry Jeffress, one of the original BushNet organisers, and his wife Melissa, who teaches part time at the school in the Learning Support Unit. They had become interested in the possibilities of a global collaborative learning project, and the local school provided funding for them to work on the project part time. (The funding would run out just after my field observations.) According to Jerry, the point of Etracks is not only to show students that this kind of communication and collaboration is possible but that "it's essentially an ordinary thing; it's something that's no different than driving to town or to working as a timber cutter".

A group of students at the school, from Years 3 to 7, are linked up with other students in Canada, Norway (at a similarly isolated small school on a small island), and New Zealand. One of the collaborative projects involves email interviews between students across the globe, which are then formatted for the web. In another activity, the students are carrying out their own investigations into local endangered species. At this school a couple of students have conducted a face to face interview with a local naturalist, and with help from Melissa and Jerry have edited it, marked it up and

published their report on the web. Further reports are to follow by other participants. In addition, students will meet online in a MOO for real time interaction, to discuss their projects and get to know one another.

All the Etracks material—including messages between teachers and students—is archived at the site, because Jerry wanted this developing project to be open for anyone to read and trace its processes as well as products, failures as well as successes.

(In presenting such “audit trails”, this electronic literacy practice marks a social and political shift towards transparency from the norms of print publications which customarily conceal their sometimes errant steps along the way.)

The very public nature of Etracks has had several consequences. The first concerns matters of content in the students’ communications. Jerry has reminded the students of the difference between private messages and public communication by telling them that since everyone could read what they wrote, they should not put up anything they would not feel happy to see on a church bulletin board. Another has to do with the formality or informality of the students’ communication. When this project was first developed, teachers wanted to check the grammar and spelling of any email messages. But Jerry thinks email is like a casual conversation and was not keen to be a “grammar cop”. The school principal agreed with him, and the following advice now appears on the Etracks page: “Email to the Etracks discussion list does NOT need to be run through a spell-checker before it gets sent. Focusing on the content of communication exchanged between primary students, we follow the philosophy of Sun Microsystems’ Chief Executive Officer Scott McNealy: the content of email is more important than perfect spelling and fancy formatting.” The same view prevails when the students are on the MOO. It is a different matter, however, when it comes to the students’ web pages. The Etracks page takes this position: “Since we feel that web pages represent a (slightly) more permanent and formal presentation than email, the Australian students’ web pages for Etracks are being edited and corrected in line with accepted regional practice.”

We can trace here various operational and cultural aspects of electronic literacy involved in those investigations into endangered species. A range of literacy skills is being practised: planning for and conducting the interview; writing up and editing the text; and learning the html tags in order to publish it on the web. In this range of processes these students are acquiring a sense of what it means to be literate in an electronic environment. Among other things it means using a browser to look at html source files; knowing how to make links; and knowing how to capture images on web pages. As Jerry remarks, these are meta-skills, meta-knowledge about literacy: they are not visible in the final product as presented to the world but are essential to support the development of that product.

Consider too the community of practice involved in this “home made” project. Compared with the Solar Car Challenge, Etracks clearly gives the students more scope to bring their own texts to the centre rather than being marginal to someone else’s scene. At present of course the purposes and concerns of Etracks originate with the teachers. So the community is perhaps a little contrived—a “life-like”, rather than “real life” activity, in Queensland English syllabus terms: see further Abbotsdale)—though no more so than most other school endeavours. Of course these are very young apprentices within this electronic culture. It may be that in time, out of this flow of communication across the globe, the students might exercise more

initiative and make pathways that follow their own interests. Meanwhile what we see here may be a first step in a demonstration that (in the words of the Etracks logo) “communicating globally empowers a community locally”.

### *Supported Learning for the Web*

Students identified as needing literacy remediation have time out in the Learning Support Unit. Among other activities they learn word processing and eventually produce connected sentences. These pieces have been published in a series of electronic newsletters. According to the learning support teachers, the sense of an audience, especially within the school, is very attractive; their publications have also enhanced the self-esteem of the students.

### *Two Case Histories*

#### Shannon

In Year 3 Shannon has attended seven schools in three and a half years. There are consequently gaps in his learning, and teachers’ attention has been focused on his behaviour. He is not learning impaired, but of good average ability. He has learned a great deal about reading and writing once. Now that he has become motivated through the use of computers to communicate in words and pictures he is prepared to attempt literacy learning again, despite his earlier dislike.

Shannon is keen on drawing and has become proficient in using *Paintbox*. His computer generated pictures feature regularly in the Learning Support Unit electronic Newsletter. He is also learning to read computer command words to achieve his goals in composing and communicating. The two skills of visual and verbal literacy were brought together when one of Shannon's drawings was sent as apcx file in an attachment to an email message to the school in Norway with whom the Learning Support Unit students had been corresponding (via Etracks). The Norwegian students replied: "We like your blue car!"

#### William

William (Year 7) has found difficulty in making meaning from words; he is a good three years behind the average in literacy and numeracy. However, his well developed spatial-conceptual skills mean that he is superb at problem solving within a wordless, mechanics/physics computer game called *Incredible Machine*

William is now a participant in the Etracks program. It was here that a breakthrough occurred. According to Melissa Jeffress, when William was watching others participate in BushMOO he wanted to join in this pleasurable form of communication: he was therefore driven to compose text.

Another sign of William’s literacy development was reported by Jerry Jeffress. All the students in the Etracks project create their own Web pages by hand, not using an editor, therefore

“ . . . it's a fairly text intensive operation. When you write html, some of the information is commands, so-called tags that generate what you see on the screen, and the rest of it is text that appears. I was surprised that William—one of the kids who is not very text literate—immediately caught on to the

procedural fact that tags don't show and that this other material does. He sees the underlying structure of what's happening, and even though I would say that he's really close to text illiterate, he realised that the stuff that's in the tags doesn't show on the screen, which I thought was a sophisticated observation.. . . So the definition of literacy should be probably cast much broader than we traditionally do."

*Herberton State School—Secondary:*

*Home is where the Page is*

Currently a home page is a rather interesting case of an emerging genre, a new practice of literacy. In a transitional stage like this we are bound to find some examples that hark back to older, print forms, while others are more experimental—testing the potential of hypertext links, graphics, animation and sound. In various ways a home page presents an electronic version of the "home owner" to be read potentially by that most unknown of public audiences, the millions of people world wide on the web.

In this next section we watch students at Herberton Secondary who despite their geographical isolation are making a small contribution to the global culture of the web via their home pages. It can sometimes be illuminating to read a school's web pages from both sides. We are mostly on the receiving side, consuming the product. Reading the school's pages might enable us to read a little between the lines about the place: to infer something about the teaching contexts, the views of learning and technology that lead to this kind of product. But it is even more revealing if we are present to observe the other side: the processes of production.

The computer studies classroom is clearly adapted from a standard issue older classroom: windows to two sides, a blackboard and cupboards to the front, with a teacher's desk. It has twenty networked computers lined up on a bench that runs three sides of the room. Further desks are in the middle, in rows and a three sided square. It is used for computing studies and social education, both taught by the computing studies teacher, Trevor Scott. The school's computing and technical support teacher, Peter Relph, works alongside Trevor in helping the students get up their pages. (These form part of an extensive set of pages developed at Trevor's initiative into highly interesting and varied site which is remarkable for a small school without elaborate equipment. This achievement has been recognised in two prizes awarded to the Herberton School student pages.)

*The Snapshot*

When the computing studies students were first learning the technical aspects of how to produce web pages they were given a sheet of prompts that their teacher had adapted from a letter of introduction proforma. This includes the usual data: name, age, physical details likes in music, hobbies, sports, family, friends, home and so on.

Although some more confident students have diverged from this formula, a number of students have adhered to it in writing their self-descriptions; for while it offers a tried and true (maybe even a little tired) set of identifying characteristics, this structure, as Trevor noted, "has enabled them to construct a home page of which they are usually quite proud"; some would otherwise have been "struggling for weeks". And of course, one of the advantages of electronic publication is that the students can at any time

during their years at the school refine or alter their home pages: their self representations can be as volatile (or as stable) as themselves.

Since most of these secondary students have utilised these prompts for their written text, in the lessons during my observations many of them were busily engaged in choosing background "wallpaper", importing a graphic they had found and downloaded from the net or a photo they had scanned. During these lessons, Trevor showed many of the students how to obtain a graphic from the screen by taking a print screen and inserting it in the LView-Pro graphics program, cropping it to size, saving it as a .gif file, making the background transparent and inserting it into their web page.

In one of those lessons, Year 9 Computing Studies, one student, Alice, wants to substitute a new background for her home page, because "I'm an individual", as she comments to Trevor and the room at large. She finds and selects one from a collection of patterns on the web. Despite Trevor's advice that a background should be just that, Alice chooses a highly assertive design—a solid red and green pattern of realistic apples. When she loads it onto her page it makes her text illegible. (This is her way of electronically representing her personality, her "individuality", as she conceives of it: by these graphics ready made and selected rather than exclusively by the form of her writing.)

#### *Commentary on the Snapshot*

In the pages of Alice and her classmates is an instance of a "hybrid" genre: a newer literacy practice just emerging from older ways of describing oneself and linking up with others. On the matter of the informational genre of the home page, Trevor notes that many teachers of computing come from backgrounds in technical studies, science or mathematics. They may therefore have limited knowledge about and few strategies for developing students' literacy capacities for such writing and experimentation—but in most cases would be open to constructive ideas about constructing the text of home pages. Trevor is a case in point: having been alerted to this through my comments, he intends in future to encourage his students to create more individualised work in representing themselves in this medium.

In constructing a multimedia home page the students must develop a range of useful skills, and some learn so fast they leave their teachers behind, especially where teachers provide them with the opportunity to do so. Philip, for example—interviewed below—has taught himself, with help, to include sound and moving graphics on his home page. Since in our multimedia environment such matters of visual representation have increasing significance, there is an important opportunity here for teachers from a range of subject disciplines to work together with their students on such production of multimedia products—as well as their analysis and critique.

Regrettably, it has not previously been considered part of the brief of an English teacher to provide a structured approach to instruction in the aesthetic and practical principles of design and layout involving print and graphics. As part of the new literacy skills the technology entails, teachers of English may need to take on aspects of what Trevor includes in the two years of his computing studies course: desktop publishing and layout principles such as use of white space, direction, emphasis, suitability, opposition, balance, and cohesion.

*Learning the ABC of a Technologised Literacy*



This site has offered a number of examples of practices in transition, some marked by contradictions between newer and older. (In another lesson students could be seen sitting in front of the computers using text books, pens and worksheets to “download” historical information.) Such unevenness is almost inevitable in schools where teachers are making it up as they go along, on the basis of their past conceptions of literacy learning. Some of these beliefs they may seek to replicate even in new contexts; others they may be inventing beyond what their past knowledge has provided them with. As Trevor commented, “At many times one must take on the role of a fellow learner with the students and also be prepared to learn from the students.”

If teachers are to move further along the path towards a technologically textured future, we need to consider not just literacy practices but also learning practices. We need to ask how we can set up a learning community for a culture of learning that is appropriate to the experiences and understandings of students who increasingly inhabit a hypermedia environment.

As a way of beginning to answer that question we listen to what a couple of Year 10 boys at Herberton Secondary have to say about learning and computers.

Philip and Jacob are two of Trevor's computer systems administrators (who include also girls); they help the other students to maintain their web pages and put up contributions to the student online magazine. The sharpness of their insights into learning is illuminating—and a reminder that we teachers need to listen more carefully than we perhaps do to what our students have to say on the subject. The boys' comments apply also to literacy learning even though they were talking mostly about learning technology and learning through technology.

For example, the boys were discussing with me how the other students were somewhat dependent on their teacher to talk them through various operations on the computer:

Jacob: They'll be able to tell you that they clicked this button and it happened, but they won't be able to tell you why that happened. That's like you're getting there but not understanding how you're getting there.

Wendy: Mmm. That kind of understanding I think is pretty important, and you people obviously do, too.

Philip: Yes. It's like the alphabet. Anyone can say the alphabet.

Jacob: But do you understand how to formulate the alphabet, make it make sense?...

The two went on to explain what they learned from exploring computer applications:

Philip: You think methodically about the computer, and if you're with the computer all the time, you automatically start thinking methodically [about maths].

Jacob: And you start to understand it [the computer] and think about it as a tool, as an extension, instead of as a big mystery, so you can start to use it for more things. . . .

Of course, tools are never merely that—they involve social practices that also shape the tool makers. This becomes clear in the boys' next comments, which indicate how much at home they have become in a culture of learning through computers and of doing things with them.

Wendy: You boys would have learnt that more or less by experimenting, by playing around, trying out, that kind of thing?

Philip: And working with Mr R and Mr S.

Jacob: Yes. See, we did Computer Studies, we did learn things like spreadsheets and all that, but then lunch times, before school and that, when you're just experimenting, and you go—"Mr R, what's this doing? How do we get into there? How do we find that?" And so it's like exploring on your own, but with someone there to get you past the hard bits.

Wendy: That's right. Otherwise you're just sort of fearful in case it happens again?

Jacob: Or you're not going to be as careful next time. If you're just told this is going to happen, the borders of reason aren't going to be as clear. . . .

Here are words that apply to learning more generally—as "exploring on your own, but with someone there to get you past the hard bits"; and as getting to know where "the borders of reason" lie—the limits of any system or field of knowledge or form of meaning making. In exploring those borders, Philip and Jacob are finding their way into the centre of a technological culture. Listen to them describing their apprenticeship (that is, learning as you go, participating in practice with the help of skilled guides, in situations which approximate to those that pertain outside formal schooling: see further the summaries and applications of Rogoff in the Abbotsdale case study). Consider the implications for the learning we set up in our classrooms:

Jacob: Say if we're doing a spreadsheet, people are going to complain, "Oh, it's boring, we've got spreadsheets again," because all they're doing is exactly what Mr S is saying: "Click this button here, click this button there, and this will happen." And they're not actually going ". . . And I wonder what this button over here does?"—they're just doing exactly what he says, and then that's it. You know, you've got to be able to press this button over here and then check what this one over there does.

Philip: You don't really need a lot of experience; you just need to be inquisitive, really, to find the things out. . . . You start experimenting with things, and when you can make things happen, you feel as though you've got power and you can make things happen, so you start exploring more. . . .

## **5. Distinctive features of the practice**

### *Learning Information and Communication Skills: Appropriate Means to Ends*

In many instances (but cf. comments on *SuccessMaker* and *SentenceMaster* below) computer technology has not been used simply to reinforce traditional literacy skills. For example, Heather Greder identified her "driving concepts" which inform and

integrate the various aspects of her curriculum as information and communication skills. Thus, with a focus on purposeful communication in literacy, "it's not just a case of sitting [at the computer] and writing and learning to spell, learning to put punctuation and things like that in there", as Robyn Grigg (Heather's Extension and Enrichment co-teacher) noted. Thus too teacher and students may choose any of a variety of sources and modes of information (phone, email, CD-ROM, book) according to what is deemed best for a particular purpose.

Heather's students are much involved in decision-making and in the processes of developing a computer-mediated literacy product. For example, the class members are selecting examples of their peers' work to be published on the Senior A web page. As Heather explained, "They edit them [the pieces] and they decide which ones are worthy enough to go up, and they explain rejections to the children—why they've rejected them. And boy! does that work." The students at their class meeting had voted against putting up everyone's work. "They consider that we have a reputation to uphold. They said everybody can do a good job, even though they mightn't all be as good as each other, and if it's not good enough, tough. . . . I'm the adult and I'm supportive . . . but I don't stop the others [students] from getting stuck into them." Of course, the student-editors have internalised the expert knowledge and authority of the teacher which they are enacting. Yet they are also being apprenticed to roles in a global, electronically mediated community.

This is one instance of a curriculum in which the students are taking a central role. It is part of a larger scheme on Heather's part, to encourage the students to learn about power, control and decision making. The students at their weekly meetings "decide the content and their pathways of learning, they choose how the class is run, they choose the consequences. They choose what they want, but then they've got to follow through." This shift in the locus of power follows from Heather's dissatisfaction with the situation in most high schools (where she has also taught): "the kids had never had to think through something. . . . Holding back is the thing [for teachers] to do, and I don't think we do it enough as teachers." (Recall the preferences of Philip and Jacob for just such exploration with support on call.) It also fits with her views of learning, and the role of computers in this. She aims to keep her students in their "proximal zone of development" (cf Vygotsky, Lave & Wenger, 1991) and believes that the computers in her classroom can prompt the students to take risks and be comfortable in that zone. (Breanna, Travis, Jessica and Heather are perhaps cases in point. This would also be true of many of the Learning Support students involved in the Etracks program.)

The publications of the Senior A Page, Etracks and the Herberton Secondary students' magazine are various instances of what their teachers aim to foster in their students: a sense of opportunity and responsibility towards making a contribution to the web, not just being users and consumers. (Sarah Clutterbuck also feels an obligation herself to give back to a community from which she has gained so much: hence her Special Needs pages.)

These instances of the wider distribution of the authority to make choices about means and ends, products and their publication touch on another characteristic of much of the practice in this site: interactions with a local and global community. This includes parents of Senior A students, the Aboriginal community, enthusiastic outsiders (Guy Carpenter, Jerry Jeffress), local and informants (the zoologist; the Solar Car Challenge webmaster), and fellow teachers and students beyond the Australian continent. In addition to the wisdom of searching for wider expertise in a distributed community of learners, there can be a practical advantage, as Sarah

Clutterbuck noted, in involving the various members of the school community: teachers are a minority group among students, parents, teacher aides and auxiliary staff—so the knowledge of technologies needs to be spread across that community and ways found to engage the various members in such learning. (See further below on professional development.)

At present, however, one of the most distinctive features of this site is the dependence of technologised literacy projects on the enthusiasm and energy of certain individuals. A little of the commendable work of teachers like Heather and Sarah, Trevor, Melissa and Jerry has been sketched here. But they have been supported by their school administrators, Lloyd Perkins, Deputy Principal at Mareeba State School and Richard Ruddell, Principal of Herberton Primary and Secondary, who are themselves electronic technology enthusiasts. Their commitment has ensured they have overridden obstacles in the form of unreliable equipment, neutral or apprehensive colleagues and the like. They have adapted machines and curricula.

#### *A Patchwork of Culture and Practice*

It is both a strength and weakness of this site that this drive to technologise the literacy curriculum depends on enthusiastic, committed, learning individuals. Any of the schools presents a patchwork of cultures and practices. This can occur between one classroom and resident teacher to another in the same school. (For example, one Year 4 teacher in one of the schools puts the class computer out of the way in a corridor, so that students working on it will not be distracted by the ongoing business of the class. It is used exclusively for the keying in of student drafts which have already been edited and proofread. And the students do their word processing under the watchful eye of a teacher aide, who manages all the discs and files.) The differences—amounting to contradictions—can also be visible in the practices of any one teacher. (No one is entirely consistent, of course.) This study will focus only on the use of so called skills and drills programs at use in all three schools.

#### *SentenceMaster and SuccessMaker*

This is a remedial reading program, structured and graded with much reinforcement (“over-learning”) to build up students’ sight vocabulary of non-content words (250 at the level of the program being implemented in Year 4). The Learning Support Teacher at Mareeba State School, Maryke Dobke, instigated its purchase after she had seen a video featuring a respected professional who advocated the *SentenceMaster* program for hearing impaired students and others who were not learning to read with a Whole Language approach. Maryke admits that “it’s almost jumping back twenty years or so”—for this approach works from elements of words through to sentences. According to the teacher, it is based on the belief that “when these kids have got enough non-content words the meaning is going to hang together better.”

The program is used to support students in a “bottom group” Year 4, which has many ATSI students, one ESL student and others with learning difficulties. Eight or ten students rotate at the room’s one computer, and spend 15-30 minutes each day on the word activity section. In his previous school the teacher of this class had been doing exemplary work in developing an original set of electronic books based on stories of the Aboriginal community (for his account of this see Morgan, 1997). The Learning Support teacher identified his approach as generally Whole Language with some explicit teaching at need, and this makes her “comfortable” with using

*SentenceMaster*: the classroom teacher is in control of the language program in his classroom, which Maryke prefers "because if it depends on me and I'm not around, nothing happens."

Maryke admitted that she could not know how far any literacy improvement could be attributed to this program as such. Indeed, she has some doubts about the effectiveness and sufficiency of the program: "once they [the students] have started to hang some things together, how much is that going to transfer into picking up other sight words that they're not going to be exposed to on this program?" And "Are those kids able to transfer and read those words into a normal text situation?" Such doubts have led Maryke and her co-teacher to supplement the program's black line masters with other language activities and texts from elsewhere.

As for the pros, in Maryke's view: students do stay on task possibly longer than for any other activity. Such attention is hard to achieve by other means in working with sight words. Students get a "visual reward" each time they give a response. And in the story section there is a kind of interaction: "you can have it being read to you, or with the voice taken out, and then they've got little icons there where you can actually press on that to get animation, or you can select to hear the voice." A further advantage for a busy teacher is that "Once you've got them [the students] on there and you've located what they're going to be working on, you can go away. They put headphones on, so it doesn't disturb the rest of the class. And I think that's a good feature in itself, too: their independence, in a way, for them as well, if they can go on working in something."

(More investigation is warranted into the use of such programs with their decontextualised activities, as one activity embedded in a Whole Language agenda. For example, how are contradictions in views of language learning synthesised—or are they left as unacknowledged tensions? How are the social and linguistic isolation of a student with headphones on to be reconciled with the richer interaction of a classroom community of language learners? And how might a student's dependence on the program develop independence in literacy learners?)

A similar but more extensive program is used at Herberton Primary and Secondary by the Learning Support teachers. This is *SuccessMaker*, which has a series of "tutorials" in carefully graded levels, from preschool through senior secondary and adult education, in English, mathematics, language, science, life skills and other areas. The school is currently conducting a trial of the program, which is to involve all the Year 8 and many of the Year 9 students. Apart from its more general applications, the staff see a particular advantage for their Aboriginal and Torres Strait Islander students, a number of whom have very delayed literacy development and need dedicated help—beyond what their classroom teachers can provide, for all their commitment—in "getting up to speed" in literacy.

In the primary context, the program is used sparingly. Students encounter it in a one-to-one situation with Melissa Jeffress, the Learning Support teacher aide. The "dosage" depends on the student's individual needs, and it is always supplemented and surrounded by other activities. Both the Learning Support teacher, Elke Braun, and Melissa expressed significant reservations about the program, because of its decontextualised, culturally irrelevant drilling. Nevertheless, both were prepared to use it as a supplement, partly perhaps because the program is already in the school (the Secondary Department is trialling it for Education Queensland). It can also be reassuring to be able to cite as a measure of progress figures provided by the

program both as "scores" discussed with students at the conclusion of a session, and as evidence in reporting.

My own first "whistle stop tour" of the various reading tutorials did not leave me with a favourable impression. Of course, I was reading from the position of an adult and a teacher educator with clear opinions about preferable approaches to early literacy. The program claims to teach reading, but from my brief acquaintance I believe it rather tests it, and could also teach teachers and students a very limited idea of what reading involves—even if there is an accompanying series of graded books on which some of the activities are based. (The detail of those impressions is conveyed in Morgan, forthcoming.) When I shared my reading notes with Trevor, who is a judiciously enthusiastic advocate of *SuccessMaker*, he commented, "the students that are using *SuccessMaker* do not appear to be as dispirited as you. My experience is that the students do not get tired and bored using this program. Perhaps it's because they have been enrolled at the correct level and have worked through the previous sequential lessons at a pace that is commensurate with their needs. Students do not randomly flip through various levels of different courses."

Clearly this is a program which inspires differences and ambivalences in its various readers. Apart from those just cited, according to Trevor the previous learning support teacher (from 1992-95) believed that the introduction of *SuccessMaker* was in part responsible for the greatest improvement in the Aboriginal students' literacy skills she had seen in her four years at the school. Trevor also acknowledged her outstanding dedication and hard work in helping those students, and this is a useful reminder of the importance of the teaching context and uses of any technology; of itself no program can be wholly good or bad, and even the more fragmentary and brainless of drilling exercises could be rendered pretty innocuous if embedded in skilled and more enlightened teaching. (However, it might also be that such tutorial programs, founded as they are on certain assumptions about literacy learning, encourage the kind of transmissive teaching that is congruent with them.)

Trevor's expertise lies in teaching the use of computers, and he makes no claim to specialist knowledge in developing the literacy skills of students, particularly of those with difficulties. But in the less than ideal world of schools, he believes that *SuccessMaker* does many things right in helping such students:

1. in a classroom where some students have very low literacy, a teacher couldn't provide the material and the individual instruction which this program does;
2. it initially tests the students, then enrolls them "at the correct level" for their skill or knowledge;
3. it covers the range of skills and knowledge, such as vocabulary, at the level and at the rate of progress that suits each student;
4. it tutors the student on a one-to-one basis; if they have problems it gives them clues and prompts them before it comes up with the answer;
5. it gives constant reinforcement for the right answer;

Therefore, on balance, Trevor judges that it makes a valuable contribution—

“. . . as an additional tool in the overall school approach to assist students in developing their literacy and numeracy skills. The actual amount of time spent on *SuccessMaker* per week, one to three periods out of thirty-five periods, represents only a very small fraction of their overall school week and there are many other strategies being employed in addition, to ensure a broad approach to assisting these students. In general I believe that the advantages outweigh the disadvantages: students enjoy using the program and appear to make steady gains if they have sufficient access to *SuccessMaker* system, although, in a school situation where there are many strategies that are being employed it is not possible to clearly identify the amount of gain made by any one particular strategy.”

However, Trevor is also aware of its present shortcomings—such as the Americanization of many topics and approaches and their irrelevance to Australian children, particularly to Aboriginal and Torres Strait Islander students. But he pointed out that the supplier of the program is likely to be involved in the gradual rewriting of many of the courses to include Australian content hence also perhaps the practices around it. Here lies an opportunity for teachers such as Trevor, through the school’s trialling, to contribute feedback and so help reshape some aspects of the technology. Trevor would like to think that in the future “we can include content that is especially targeted at Aboriginal students”.

And what of student users of *SuccessMaker*? Here is a little of what I saw and heard from some Aboriginal and Torres Strait Islander students who were “enrolled”. Joe has been at the school for only a term; he’s a virtually illiterate Year 8 Aboriginal boy, tall, with the gangliness of a young adolescent. In a learning support session he’s sitting at a computer with earphones on, working his way through exercises from an “Initial Reader” workshop: “Word Meaning and Reading Sentences”. He laughs aloud when he answers correctly and a yellow rosette becomes an animated figure jumping for joy. At the end of the lesson his teacher checks his score with him: 77% right: he has answered 27 questions correctly. . .

Like Joe, Margaret came to the school in Year 7 from the Torres Strait. She speaks English as her second language and could not read when she was in Year 6. She’s been using *SuccessMaker* consistently for a year. I asked her to describe what she did in reading at the computer:

Margaret: Fill in the missing answers and that.

[This is *SuccessMaker*’s definition of reading—like that of a number of teachers.]

Wendy: What’s the best thing about *SuccessMaker*, as far as you’re concerned?

Margaret: When you’re getting it all right, all these little pictures coming out at you. . . . Sometimes I can beat my lower scores, like I’m going up.

Wendy: What’s the worst thing about *SuccessMaker*?

Margaret: When I get it wrong.

(It seems that for this student the program is beyond criticism; she accepts its judgement of her errors.) Trevor added to this fragmentary picture by noting that the school had recently conducted a survey/interview of about 29 students who were using *SuccessMaker*. “The overwhelming majority enjoyed using *SuccessMaker*, thought it helped them to learn, liked the way it would prompt and guide them if they were unsure of an answer and the way they could learn at their own pace.” (Nonetheless, I admit to some continuing concern that these youngsters like Joe and Margaret who come from richly oral and visual and contextually grounded cultures are being subjected, even for part of their schooling, to a program whose instruction in literacy is so narrow.)

Now it is doubtless true enough that *SuccessMaker* can be a useful resource and supplementary tool for busy teachers—at least perhaps in that literacy learning sphere of the operational. But any computer technology is never just a resource, a tool—it also brings with it a context for learning and a culture for understanding (in this case) what you do to be a learner, and what counts as reading. So whatever answers the program gives students it could leave unanswered a number of important questions—which would have to be supplied by informed teachers. For example, what does it mean to read successfully? How can we teachers, who understand the purposes of reading, who have been inducted into the culture and the practices of a reading community—how can we set up this kind of purposeful context for youngsters? Where is the scope for pleasure, for play and inventiveness, for imagination and for exploration? (The only fun I could detect that *SuccessMaker* offers students is in getting answers right and comparing their score with their previous performance.) Where are opportunities for judgement and critique? Or for using texts for one’s own purposes?

The concerns expressed here are derived from very brief acquaintance, and there will continue to be debates with and among those like Education Queensland and schools in other states of Australia and elsewhere that have invested their funds, hopes and beliefs heavily in *SuccessMaker*. These opinions need to be supported by research. Research, of course, can be used to support or critique just about any teaching technology, and some such independent research—far more elaborate than the brief foray reported on here—supports the effectiveness of this program (available from the home pages of *SuccessMaker*). Such debates, and such research, must be engaged if technology is to be used as wisely as possible for literacy.

## ***Issues and implications***

### *Professional Development*

Among the many possible issues which might be taken up, professional development looms large, and might begin to address other aspects touched on elsewhere in this site study, relating for instance to the “patchwork” of culture and practices or to the fragility of initiatives that depend on individuals. (In 1997, for example, Sarah is no longer teaching; and with the end of funding for Etracks Jerry and Melissa are no longer employed at the school.)

The remarks that follow are derived from comments, many of them unprompted, by the various teachers and principals of this study.



At Mareeba School, apart from the committed support of the Deputy, one of the most salient factors behind Senior A classroom's use of technology is the peer support and coaching among the three teachers involved. Sarah's enthusiasm was infectious (she had become interested in computers and did a course in Computers in Education as part of her degree; after that she has just "mucked about"). Her "team coaching", as Heather calls it, enabled Heather to "see the advantages—how we could use it in the classroom. And we had somebody there who could help." Then Robyn learned from the other two playing around: "And because they're so enthusiastic about it, whenever you're around them you're enthusiastic with them." The teachers have made reciprocal class arrangements: Sarah sometimes works with Heather's students and vice versa, or the two arrange peer tutoring of Sarah's students by one of Heather's year-level groups while Sarah works with the remainder of Senior A. As Sarah comments, "I'll put time into there because I know then that Heather will go on and show other people, and also we can now use the students as a resource."

Such enthusiasm needs to be sustained and supported: time and again the teachers stressed the value of grass-roots, collegial, low key inservicing on the spot, by invitation and with encouragement. Action research can be an extension of this; as Trevor commented, it can be important for inserviced teachers to need to apply their new knowledge in a follow up activity, with support available as they try it out for themselves. So too in Lloyd's experience the only way to get people to integrate the technologies into the curriculum is via an action research process. This may be time consuming and costly but really does have results, since it is based on teachers' beliefs and what they value about learning, how they believe people learn, what makes a good classroom and so on—none of which can be discussed in any depth in a two hour presentation.

According to Lloyd, the only other way to get everyone in the school using technologies is to mandate it through work programs—e.g. "students will in Grade 5 access the Internet and they will complete a project based on online searches." Not all teachers may know how to set this up that, but would be forced to learn. Lloyd thinks the school could not yet meet such requests to skill people. For now—"It wouldn't work. And who would be blamed? Not the classroom teacher because it wasn't done. The classroom teacher will pass the blame back to someone else who mandated it in the first place, because you haven't provided the training of skills."

Enthusiasm and teacher-initiated learning are certainly essential. This is not to suggest that expert technological support is not also crucial. The absence of enthusiastic, knowledgeable teachers has prevented some of the BushNet schools, especially the smaller ones, from taking up the opportunity to explore online technologies. But even where such schools have enthusiasts on staff, it can be difficult and costly to access technological support for hardware and software—sometimes all the way from Cairns to remoter areas. In some cases this means developing a do-it-yourself expertise. The Deputy at Mareeba, Lloyd Perkins, for instance, has become a trouble shooter not only because he has had opportunity to tinker during school time, but more importantly when faced with teachers saying their technology will not work had to learn how to fix it since he wants them to use it. Thus what he has learned on one occasion he profits from on the next.

Enthusiasm also needs to be supported by administration. For instance, while Sarah has been very generous in providing help and advice to her colleagues, Education Queensland provides no time release for that ("I think it's probably been the cause of the most stress in my life because of the demands on my time"). She believes there

is a need for an expert and enthusiast to help teachers learn how to integrate a single computer into an English, Social Studies or Maths program—for example, via open data bases and spread sheets, powerful programs that are presently underutilised.

At Herberton School too Jerry and Trevor both mentioned the enthusiasm of colleagues on the spot as crucial to the success of the integration of technologies into the curriculum. Indeed, Jerry thinks that an "enthusiasm builder" is more necessary in a school than a technologist, one who will say to fellow teachers: "Did you know you could do this?" and then leave, let them think about it for a while, and then come back in a week." . . . "There needs to be this little squad of enthusiasm builders (but there's no place in the structure for them) to flit around from place to place. Their purpose is to make you think that you have a need to know, and then maybe you will. When do you know what an innovative practice is, unless somebody shows you?" (Lloyd also mentioned other, complementary, qualities: perseverance, preparedness to take risks, and "some sort of logic, some sort of mapping".) Of course, while this concept of "enthusiasm builders" makes sense and certainly fits in with the comments of Heather and others, Mareeba and Herberton schools show that it alone cannot guarantee quick, sure, uniform results. And reliance on its source in particular individuals can lead to the fragility of any endeavours.

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 fully technologised literacy. As we have seen, the teachers themselves can identify the ways of learning that work best for them and the kinds of support they most need. That too might mean reconceiving their roles within the school, local and global community as mutually informative learners. Perhaps these ways and means need most of all to be underpinned by the teachers' convictions about the entitlement of their students to a comprehensive literacy for a technologically saturated future. Telling cases like these success stories for students explored in this report can work very powerfully on teachers' imaginations. So it can be too when teachers try something out, share their experiments with others (perhaps with less eclat than the webbed products of Sarah and Heather, Melissa and Jerry and Trevor) and talk about it with interested peers. So practices are developed, and over time an ethos—a culture—can be built.

## **7. Conclusions**

This site has shown something of the potential of the new technologies to enhance, extend and redefine students' literacy when these technologies are used in sound ways by innovative teachers. It has also shown how uneven—patchy and sometimes contradictory—such practices are, and how fragile their continuance can be if it depends on enthusiastic individuals. On site, grass roots, professional development, supported at a policy level, is crucial to the maintenance and extension of such initiatives. It may also need tactful support by other literacy professionals if sometimes limited or inappropriate assumptions about literacy and learning are to be examined and better ones developed by teachers in terms that make sense to them.

As Heather commented to another researcher, "This visit by a knowledgeable and supportive educator who did not terrify me with technical jargon was the most effective "Technology PD" I have accessed so far. Dr Morgan presented first and foremost as a fellow educator who was fully appreciative of our efforts to provide students with relevant learning activities and opportunities. As she worked with students, parents

and teachers throughout the school I gradually got the message that, while what is happening is great, we may need to take into account that many students have very different “technologically constructed world views” from those held by many educators in the established educational setting. It is not good enough to just use technology to enhance existing teaching/learning experiences; the teaching and learning experiences we provide may need to be very different if we are to build on the technological experiences out students bring with them to the classroom. I’m still striving to reposition myself as my ideas about literacy learning and technology change.”

## **CASTLETON: COMPUTER BASICS MAKES FOR COMPETENT, CONFIDENT YEAR ONE STUDENTS**

### **1. The study at a glance**

This large school in a relatively low socio-economic area of Sydney has had a focus on technology since its opening in 1987. 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. The computer coordinator whose Year 1 class is described below has therefore had the benefit of continued support from the principal and school executive together with access to relatively new hardware and software.

This report is of a Year 1 class of 30 students. However the students spend each day with their peers from the adjoining class, the dividing wall folded back to make one large area with 60 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 Maggie's class and especially on the use of the one classroom computer shared between 60 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.

This study reports on ways in which these teachers work with parents and older students to incorporate computer technology into programs so that students take some of the responsibility for their learning. Word processing skills are valued as a means to improve presentation of written texts, at the same time space is made in the curriculum for more traditional approaches to spelling and grammar.

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.

### **2. The site**

Castleton Public School was opened in 1987 and has had a strong commitment to technology from its beginning. The entire school is networked to two curriculum servers, a communications (Internet) server, and an OASIS server, all of which are accommodated in a library workroom. Each demountable classroom has a workstation while for the rest of the school a workstation is shared in a common reading room between two permanent classrooms. Since 1995 the school has had access to the Internet through the *Skippy Network*, a network of approximately ten schools which provides Internet access 24 hours a day, seven days per week for \$1200 a year. There is access to computer technology in the staffroom and an Internet terminal is permanently set up in the main foyer for the benefit of parents. The school has also recently been connected to Ozemail through the State Government's *Computers in Schools Policy* (see below). Each classroom is also linked to an "in-house" video network run from an audio visual room. This video network is used to deliver current affairs programs, Indonesian satellite broadcasts

and live performances from the school hall. The school has its own FM radio station, 2CG-95-FM. Year 6 students broadcast weekly stories, news and music during the midday lunch break.

The school population is approximately 25% non-English speaking background and has 12 Aboriginal or Torres Strait Islander students from seven families. Socio-economically the area is considered to be in the lower to middle class range. Parents and community are considered to be supportive of the school evidenced by the fact there were over 120 parent and community helpers at the "thank you" morning tea organised for them last year. The principal believes that many of these helpers build up confidence while they are at the school, then move on to gain employment. The school has an open door policy with parents invited to come in at any time.

### **3. The policy context**

All school policies outlined below are linked by the school management plan into which everyone has input.

#### *Technology*

Under the State Government's Computers in Schools Policy (CISP) the school has received a connection to the Internet, an Internet machine, software and a one day University based Introduction to the Internet training course for one teacher (the Internet Contact Person) in the school. The school is also eligible for training for approximately one third of its teaching staff in the Technology in Learning and Teaching (TILT) program. This is a one semester program designed for teachers who are not currently using technology in the classroom. It involves six satellite broadcasts, six hands on workshops led by a trained facilitator and three days casual relief per participant for inschool follow up work (also supported by the facilitator). The Computers in Schools Policy includes the provision of curriculum support materials, student, teacher and administration Web sites and additional computers to all schools bringing the computer/student ratio to 1:14 by 1998 (this does not include what schools already have). CISP has also provided 40 Technology Advisers across the state whose role is to advise schools on planning for computer technologies.

In light of the changes currently taking place within the Department of School Education the school's technology policy is in the process of development. All Key Learning Area (KLA) leaders are part of the school's Technology Team as well as the principal. Funding is managed by a finance committee which includes members of staff, parents and the community. Practical inservicing in, for example, the use of various software packages, is a priority. Measures are taken to ensure that everyone is kept informed of software and hardware acquisitions. As Computer Coordinator in the school Maggie plays a key role in decisions concerning computer technology.

#### *Literacy*

The school does not currently have a literacy policy. A number of schools across the state shelved literacy policies pending the result of the Eltis enquiry into Profiles and Outcomes based education, commissioned by the NSW Labor Government when it came into office in 1995.

The Literacy policy team is waiting for the revised version of the English K-6 syllabus document. It will be revised on the basis of the state literacy policy, which is under development.

#### **4. The practice**

[The classroom observation excerpts quoted below are of two Year one classes in a team teaching situation on a very wet Friday—sixty students had to remain inside all day.]

To the right of the classroom door, placed diagonally across the corner of the room, are shelves and the teacher's desk. Across the corner opposite the door is a glass partitioned area entered from the classroom. This is the reading room where the computer is located. It is shared with the adjoining classroom which is a mirror image of Maggie's room. The two large airy classrooms adjoin in the middle, the partition is permanently left open. The rooms also share a large, well lit wet area which can be accessed from either classroom. The classrooms are entered through this area, which has a table in the middle, pegs for coats and lockers for shoes and bags.

There are windows down each side of the room. The students' tables are arranged in a line of four down the wall opposite the door and a line of three to the left of the door. Four students sit at each table, two down each side. This arrangement leaves a large clear area in the middle of the room.

Strings from which hang student paintings stretch the length of the room. On the end wall hangs a huge fabric collage computer keyboard, made by the teacher and spread on the floor for a variety of activities during play.

While the morning's activities are taking place, a parent is working with small groups of three in the reading room on collaborative writing activities. They are using *Kid Works Deluxe* to construct a story book. The software provides a work space which simulates a book. The groups decide upon a title, add their names as authors, then generate the text as they progress. Illustrations are added to pages facing text pages as they go. The parent prompts students throughout, supporting the writing process, flow of ideas, and group collaboration. All editing is done on the computer. Groups change approximately every twenty minutes. The process is illustrated by the example below.

9.35

Parent: Do you remember how to save it? (she points to the screen indicating procedure and a boy saves using the mouse). The group returns to the class.

A second group enters (2 boys and a girl).

The girl sits in the middle with control of the mouse and keyboard. The parent reminds the group they have to sign in. The girl selects the sign-in icon and then the group name. She locates and retrieves their half finished story book, and clicks on the "read" icon. The computer "reads" the story so far. It is a cumulative narrative written in a mixture of first and third person.

The parent and 3 students discuss what to write next. The parent then dictates the agreed sentence as first the girl types followed by one of the boys. She dictates each keystroke (s....h.....fullstop.....space.....capital letter...) The students argue over spelling and the parent confirms the correct spelling when called on for an opinion. They finish the writing and want to draw a picture. The parent guides the students to the "paint box" and together they make decisions about the composition of freehand drawing and prerecorded stamps provided in the program. The parent moves the students on to the next page of writing. The girl still has the keyboard. The parent prompts with spelling. It's changeover time, the work is saved and the students return to the classroom.

Three boys arrive.

The text of their story reads— The dog was chasing the bird trying to get the goldfish back. There was...

Child: I can't spell "was"...I've already spelt it. (Finds it and types it)

Parent: (prompting the students to keep going) There was a lake and then what happened?

Child 2: I want him [the computer] to read it.

Parent: Not yet. Finish the sentence.

Child: and the bird dropped the fish in his mouth...

The child highlights the writing using the mouse and the computer generated voice reads it back.

Students swap places so each child types.....but the dog caught it.....

Students swap seats again. Do you want to put a picture in it?

Students select picture from prepared library and paste it into their text

Towards the end of their second year of formal education these students are confident and competent users of this particular hardware and software. The parent provides an expert opinion when required, however students create the text, the student in front of the keyboard often having the final say. In this way students have some control over the task although their control is bounded by the presence of a mediator (the parent) who, by her presence, influences the group dynamics and ensures maximum time on the writing task. Control of the task is also bounded by the fact that groups change over every 20 minutes. This has the enormous benefit of ensuring equal access to a scarce resource for all students, however it may fragment the flow of ideas and is probably not so much seen by Maggie as a text creation experience but as an opportunity for all students to become familiar with the technology. It also provides an opportunity for parents to participate in the work of the classroom and contribute to extending the possibilities for student learning.

Maggie's practice has changed considerably since beginning teaching. Ten years ago she was "doing a lot of 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 (this mirrors the history of curriculum development and must be the experience of many teachers throughout the state (see Parker, 1993)). Although commercial software has taken the place of some of the commercial texts, unlike texts the software is modified to meet class needs (and sometimes vice versa). However it brings with it the need for a different set of basic skills and 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.

Associated with the introduction of new technologies and the sharing of scarce

resources whole class instruction based around the chalkboard has been replaced by increased emphasis on small group learning. The excerpt below from classroom observation illustrates this move towards group work.

9:15

Reading Group Activities:

The teachers take turns to explain tasks to the groups. Group 1 is to read from page 18 to the end of the book *People and Leisure* (Factual Text) and then to cut out (and paste into their books) magazine pictures of kids engaged in leisure activities.

Group 2 is reading *Breathing* (Factual Text). They are to read through the book then collect one of the animals (snail, worm or slater) and draw it.

Group 3 is making a story map of *The Calf That Couldn't* on a prepared sheet of paper. A group is writing about frogs and another about birds.

When all groups have been given a task the groups are asked to stand, remember their manners...make sure they have their partner, and move to the tables.

9:32

There are two reading groups on the floor each with a teacher. The *Cat and Mouse* group read vocabulary words from the text with Teacher 2 then move to their desks to complete a worksheet based on recognition and spelling of these words (sentence to trace, words to be written in boxes). Later they read to Teacher 1 individually.

Both teachers move around the double room assisting students with tasks as required.

10:30

Spelling test

The words are divided into 3 groups and students are allocated a group of spellings to learn, but (as the teacher later explained) all want to have a go at all words. The teacher reads the words, uses the words in sentences, repeats the words, then asks the students to say the word. She corrects pronunciation before allowing them to attempt to write the word.

The students are instructed to take 3 coloured pencils, a different colour for each set of words. The first of five words for group 1 is "doll". Group 2 has 10 words (flat, fly, flip, float, flop, flock, flag, flood, flap, flow), group 3 has 5 words (people, time, leisure, places, holiday).

Students had a highly positive approach to these reading and writing activities seeing them as "fun"—including the spelling tests! Although working independently on the group tasks students were free to consult with each other as well as with either of the two teachers. There was a relaxed, happy and busy atmosphere in the room.

The use of text books and "readers" has been supplemented by a range of learning resources such as the Internet, multimedia (*Kid Works Deluxe*) problem solving with *Lego Logo* and *Thinkin' Things 2*, word processing for publishing and writing, and software such as *Maths Circus*, *Dangerous Creatures*, *Winspace*, *Number Munchers*, *The Playroom*, *Arthur's Teacher Travel* and *Super Spell* to support other aspects of the curriculum. This software is either content free (e.g. *Kid Works Deluxe*) or else has various levels of difficulty which allows students to choose their entry point. This range is available for free choice of activities in the afternoons. A typical afternoon



might see for example a group using *Logo* on the computer working collaboratively to steer the turtle through a maze. Meanwhile another group may be engaged in a similar activity steering a child carrying a Koala through a maze drawn on the floor, they may take turns giving commands, “maybe 10 [steps]—no she’ll crash into the wall—look it’s too far—now look what happened—go back, go back.” Here group members interact and negotiate freely, there is time to explore software (and no need to change over after 20 minutes). Real problems can arise and require a solution. In Maggie’s words, “It provides a collaborative work environment supporting freedom to explore and opportunities for students to take responsibility for their own learning”.

Maggie believes that new technologies provide enhanced problem solving and literacy development opportunities which her students will need to be able to “read the written word, retrieve information and communicate effectively in their post school lives which are likely to require competent use of the computer”.

Word processing skills will be increasingly important to these students. This includes editing, the use of icons, cutting and pasting, as well as typing. Presentation skills will also become more important and technology will play a role in levelling the playing field in this area, as will grammar and spell checkers in the area of literacy. All of this means that publishing and formatting of texts will have to be a classroom focus. However traditional literacy skills such as spelling will continue to be essential, for as Maggie says, “The Internet is an interesting example of the need for spelling conventions . . . if you can’t spell it . . . you can’t find it”.

Maggie’s enthusiasm for new technologies has come to some extent from DSP teacher development programs, the school administration, 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. The principal’s support was demonstrated when Maggie suggested the purchase of an LCD projector panel despite the significant cost involved. Since its purchase, the resource teachers have found far more opportunities for its use than originally anticipated, a fact that provides some sense of satisfaction for Maggie and has reinforced her role in school as a leader in the adoption of new technologies.

All of these things have contributed to the fact that Maggie feels very comfortable using technologies in her current teaching practice. However she feels that she has a long way to go in understanding different types of hardware and software capabilities particularly with the speed of change characteristic of the technology.

## **5. Distinctive features**

The principal’s enthusiasm and commitment to information technologies throughout the school is a distinctive feature of Maggie’s working environment. It is exemplified by the school’s early membership of the *Skippy Network*, the networking of the school computer systems and six phone lines into the library with the accompanying easy access to the Internet and email facilities. Computers are used equally from Kindergarten to Year 6 which may have something to do with the students’ perception that you “get better as you get older”—improvement was seen as something as natural as growing.

This teacher's aim is to educate everyone fairly. In the classroom this is reflected in a well structured timetable that ensures equity of access to resources such as the computer. Maggie is aware that girls tend to hold back and structures groups so that everyone is sure of a turn. This emphasis on fairness is reflected in the views of the students interviewed who all felt that they used computers "all the time" or "lots and lots" in their learning (even though most of the time there was only one computer for 60 students). Despite the ratio of computer to students, student perception was that they had constant access to computers. 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 that they would not be overlooked when it came to their turn at the computer.

A highly structured framework, of which turn taking is a part, evidently provides a strong sense of security. Students can direct their own learning within familiar boundaries. Literacy skills teaching exists along side more open ended activities such as group construction of multimedia "books". It is interesting to note that this is the construction of multimedia *books* rather than *texts* (as in for example *Kidpix*) which probably adds to the feeling of security (in the familiar). This control over the potential complexity of learning situations is a feature of the classroom and reflects Maggie's belief in a developmental model of student learning.

Students also commented on the ready accessibility of computers at "big lunch". For example:

At lunch time one of the girls with the teacher's aide prints her pre-saved stories. This Yr 1 student is able to select her disk, hold it correctly and insert it in the disk drive. She opens Clarisworks and uses the file menu to open, print and save her stories. She knows how to load paper into the printer.

Students acknowledged that although the teacher had taught them to use computers initially they were now learning from each other and from older students. For example Maggie has a peer support program with one of the Year 6 classes which specifically focuses on computer use.

One of the distinctive features of this classroom was the orderliness of 60 students throughout what was a long day indoors. The class routine was well established and moved in and out of whole class, group and individual work (number facts and spelling test) while at the same time small groups of 3-5 students each spent 20 minutes in the computer room with the parent volunteer. This does not happen by accident, a great deal of explicit instruction on working independently and in groups has taken place over the year (Hill & Hill, 1993; Johnson, Johnson, Holubec & Ray, 1984; Bellanca & Fogarty, 1991). The following excerpt from the observation serves to illustrate the routine and classroom organisation.

9:10

Students tell news in groups then move to their desks to complete five addition problems (addition facts for 7) written on the chalkboard. As the students complete this task they move to the central floor area between the two classrooms and join in a singing activity. When all have joined the group a discussion takes place concerning the snails and worms which some class members have brought in. Meanwhile three students emerge from the glassed in reading/computer room and quietly tap another three on the

shoulder, who disappear for their turn on the computer.

While students are required to take some responsibility for their learning Maggie takes absolute responsibility for teaching *all* students. She sees her primary role as being there to teach her class. One 7 year old girl described her teacher's approach in this way: "She does it very well because she waits until we get it into our heads. She says 'Has everyone got it?' If someone says no, she explains it again. Some people think they get the hang of it but they think the wrong thing and they ask the teacher and she helps". This is the explicit teaching referred to by Delpit (1988), which she says is essential for students from low socioeconomic backgrounds who do not belong to the culture of power to gain access to "the discourse patterns interactional styles and spoken and written language codes that will allow them success in the larger society". In this classroom it appears to produce very confident learners like one 6 year old boy who when asked who teaches him to use the computer said "I teach people . . . Sometimes other groups because I'm an expert . . . I know how to use every program."

As well as this general confidence in their ability to use computer technology students interviewed had a positive view of the way in which the computer handled what they labelled as "mistakes". Freed from the discomfort of making mistakes they had a curiosity about and willingness to explore and experiment within the environment, as one student said, "I just open it up and look around—that's how I learn".

The computer environment supports all of the learning advantages of play which have been recognised in early childhood programs for many years (see for example: Porter, 1985; Rubin, Fein & Vandenburg, 1983; Rogers & Sawyers, 1988; Wright & Samaras, 1986). 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 (albeit within parameters set by the software, the task or the teacher) 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, (this link with play has been explored in detail by Fatouros, Downes & Blackwell, 1994).

As well as being in agreement on the unimportance of "making mistakes" (or the importance of being able to without undesirable consequences) in a computer environment students unanimously believed in their own ability to use computers. This leads to speculation that there is something in the computer environment, the voice, the language, the look and feel, and the way that the environment supports learning which could usefully be applied to other learning environments.

## **6. Issues and implications**

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. As Maggie says "not all teachers welcome the use of new technology and these people need to be approached carefully." She sees a move towards more Australian based software targeting literacy and learning as one way of

engaging the interests of reluctant users of new technologies.

If the next generation of teachers is to successfully engage students using the new technologies then keyboarding skills and basic familiarity with information technologies and their educational implications must become a compulsory feature of future teacher education programs.

Such instruction may well lead to a reconceptualisation of the teacher's role in the classroom and the kinds of technologies which support a learner focused rather than a teacher centred environment.

Preservice teachers need a greater understanding of the role of teacher as text producer rather than text user. As Maggie says "No longer do we purchase text books, but we design our own workbooks to fit the students." A greater facility in the use of information technology makes this challenge a possibility.

There is a need for teacher educators to make explicit the skills required in research processes and the ways in which students can be assisted in understanding the research process and how new technologies can be exploited. To do this beginning teachers need a range of experiences and basic competencies in order to support and motivate students in the classroom.

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 (see for example the NSW Department of School Education's homepage or the Association of Independent Schools' StudentNet for examples of home school interactions ).

While such blurring can be exploited by the education community we need to be aware of the issues of equity and access in a world where the gap between rich and poor is ever widening. There is a need 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.

By way of meeting this challenge there is a need for resourcing bodies to ensure sufficient new technology facilities for all students. In NSW the projected ratio of computers to students is 1:14 in 1998, with even greater access for students with special needs. The new machines are being leased making upgrading a reality for all schools as part of the NSW state government's commitment to equity of access to the most appropriate hardware and software.

One of the resourcing problems facing all schools is the provision of technical support, and the upgrading, maintenance and repairs of current equipment.

## **7. Conclusions**

The school would like to see a movement towards more Australian based software. The suggestion is that state school systems seek opportunities for partnerships in the development of Australian focused software for student use in schools. The school

recognises the importance of networking and access to the Internet as crucial to student learning today and would encourage other schools to investigate opportunities to work together to gain services and support that would otherwise be out of their reach.

## EALING GRAMMAR—A SITE OF COMPUTER INTEGRATION

### 1. *The study at a glance*

At Ealing Grammar, the words “curriculum” and “learning” always come before “technology”. Initially, I wondered whether it was empty rhetoric, but was soon persuaded that the connections made between these three words, and the order in which they were consistently uttered, were emblematic of the school's approach to the integration of technology. The Principal, the Head of Computing, the Curriculum Coordinator, the Head of IT 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).

The school is distinctive because of its model of careful curriculum planning. Before any changes to technology practices are made, there is consultation between those involved across the curriculum, at all levels. Every effort is made to avoid top-down imposition of a technology policy. The teachers, who are implicated in the curriculum and technology initiatives, are provided with opportunities to plan and prepare for changes.

As the students do not have personal laptops, a visitor can walk through the school and not see computers in every classroom. Class sets of laptops are visible in particular rooms, students are using the Internet in the library and several other places, and in the staffroom there is a table of computers always in use. The section of the school where the computer labs are located is the obvious centre of computer activity, but clearly not the only place where computers are used. The labs are where the multimedia project, the focus of this case study, is in full swing.

This case 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 greater 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 labs for the term which each curriculum area devotes to the project, extra technical support is available.

## **2. The site**

There are 1200 students at the school P-12. The school is located on 16 hectares, 16 kilometres from the CBD of a State capital. Since the late 70s, the school has implemented a computers-across-the-curriculum program. The first teacher to push for the use of computers was the Head of Maths, a woman. Soon after, the current Head of Computing, a man, was appointed to look at computing across the curriculum. He was not attached to a particular department which he believes was a smart move by the Principal at that time. Technology thus didn't become the province of Maths and Science, a situation which has created problems for the Humanities and Social Sciences in other school contexts. The school has always assumed the view that the adoption of any technology should be driven by the needs of the curriculum and the students, and not simply for the sake of introducing the technology itself. This approach has been supported by ongoing professional development. A lot of the professional development is in-house, often following through ideas that individual members of staff have picked up at outside courses.

When pressed about the notion of the curriculum driving the use of technology and the extent to which it was rhetoric, all the teachers interviewed with one exception confirmed that this really does reflect the approach adopted in the school toward the implementation of technology across the curriculum. The teachers take it upon themselves to justify all that they are doing in terms of direct value for the curriculum. They are interested in exploiting the potential of the technology as a tool that can enhance learning within the school community. There is a clear match here with the current rhetoric of the Department of Education in Victoria, but whereas in many of the public schools it is difficult to see evidence of the implementation of technology to enhance learning, at this school it is ongoing practice. Schools in Victoria designated for special treatment such as the Navigator Schools are a notable exception.

The school provides extensive computer resources for its students. Rather than requiring students to buy their own laptops—the direction that many private schools across the country have taken—the school provides an integrated system of desktop and laptop computers. Machines are leased by the school for three years. Rather than prepackaged software, the school has gone for general purpose software with which, it is argued, the students can be more creative. It's of interest to note that in the school community, 90 per cent own home computers. The ethnic background of the school community is multicultural with the majority from middle- to upper-income families.

The school provides one computer for every four students. Representations are made by a number of committees but principally through the Computer Resource Committee that has student representation. The students also have a computing committee that is lead by the Computer Captain and has year level representation. The idea is that the students, who are the major end-users, have an opportunity to express their concerns, frustrations and desires, and it seems that their ideas are generally taken up. This committee is the one in which students are most active: students help look after the network and the school homepage.

The labs are open from 7.30am till 6.00pm. There is a laptop library of 100 computers available for borrowing. They are used constantly. Computers are in labs, the library, most departments have them, and in the staffroom. A special assistant looks after the laptops and they rarely go flat in classes.

There is also a lot of communication with the parents about computing. Efforts are made to ensure that the home and school are “compatible”. It doesn’t matter whether the home computer is Mac or IBM—students can now relatively easily interchange disks from both operating systems. Computers are on the agenda at meetings with parents, and special events around computers are also organised such as the Computer Expo. On Open Day, there is a major exhibit of the students' computer activities. Unlike other Victorian private schools, this school does not market itself particularly on computer technologies. It likes to think of itself as broader in its concerns. Technology is an intricate part of the school culture and fabric but it is not a “technology school”. The example of a private girls' school in another city where the experiment with technology was less successful is explained as a “policy mismatch”. The Head of Computing argues that a child-centred approach to technology has to be accompanied by a matching curriculum policy.

This is evident in the ways in which the school uses multimedia, laptops and the Internet across the curriculum. The Head of Computing emphasises that the use of technology at this school is “curriculum driven”. This multi-faceted approach gives students and teachers the flexibility to use the appropriate technology for each situation—having to choose, it is argued, will help them become confident and discerning users of new technologies. As the computers are leased, contribution towards the cost is met by a computer levy of \$200 per student per year.

Two years ago, the school began a partnership with Optus Vision to trial Optus's high-speed, broadband connection to the Internet. A separate local area network was installed in the library. It includes twelve computers for student use and two computers in the library-staff work area. A recent extension to this network now allows for over 150 simultaneous connections to the Internet. The school's server is also connected to this network. Most of the computers are ApplePower Macs including a Power Mac 8500 AV for video conferencing over cable. The cable was laid underground from the street to the school's Audiovisual Department where cable TV is also provided.

As part of the trial, the school is documenting projects undertaken. This process includes teachers' classroom notes, student worksheets, assessment procedures and staff/student response to the use of the Internet. Staff are also developing their Web home-pages on the school's Web server to assist students with their projects. The Web pages contain project notes and suggested URLs for research. The following represent examples of the kinds of projects in which students are engaged: all Years 7-10 are being trained in the use of the Internet—browsing, searching, bookmarking and annotating sites; Web-page publishing is being developed; Teacher/Librarian together with English and History staff are investigating the skills required for notetaking and information gathering from electronic media; Year 10 Literature is exploring useful sites for Literature.

Of great interest to the Optus project is the amount of staff discussion and consideration of the curriculum and teaching and learning implications of these



activities. They discussed educational opportunities which included rethinking the structure of schooling; more specific issues such as the need to teach critical literacy; even theoretical issues such as the extent to which the medium is the message and whether the Internet is the best resource available. They also took into account support and training issues; and ethical issues.

### **3. The policy context**

A clear technology policy certainly exists but is perhaps more implicit than explicit. All those in positions of responsibility to whom I spoke were consistent about the directions the school was taking in terms of technology. The Curriculum Coordinator explained that the teachers are simply too busy doing other things to sit down and formalise policy. A number of members of staff, including the Head of IT and the Curriculum Coordinator attend and present at conferences regularly and report on developments within the school. It is possible, for example, to look at annual reports to get a sense of the policy that has been enacted over the past year. Also, several page-long documents directed to parents have been created. In these ways, the Curriculum Coordinator tells me, school policy, initiatives and developments are articulated.

The beginnings of the development of a policy in relation to technology, began in the late 70s. A compulsory Computer Inservice Staff Day in 1980 signals the school's foresight about the growing significance of the new technologies for education. Out of this day, a cross-curriculum group was formed. The members developed their skills and encouraged colleagues to do the same. Word processing was introduced in 1982 and the question was posed: Does its use improve writing, or is it simply another way of doing the same things we did with earlier technologies? The teachers also discovered early on that poor keyboard skills interfered with the easy flow of ideas. So the school began to build up a keyboarding program in the Primary School. This was followed up by a compulsory program in Year 7 which used typewriters as they could not afford enough computers.

The Head of IT explains that since the introduction of computers in the late 70s, the policy has been to use them across the curriculum wherever appropriate. His job has been to work with teachers in particular subject areas across the curriculum to find ways in which to use the technologies. He points out that there is a formal committee structure that facilitates discussion of resources and curriculum development in regard to the use of computers, but what is of even greater value and importance are the informal relationships that have sprung up.

Communication with the parents of the students and the wider school community ensures that these groups are kept informed about developments with IT and the expansion of services and applications available to students. An issue of a monthly newsletter has a double page spread called "Computer Update" which talks about the school's multimedia project at Years 7 and 8, the purchase of more laptops and makes clear the school's policy of leasing the hardware and purchasing site licences for software.

In this newsletter, the relationship with Optus and the Internet project is explained to parents as well as the formation of the cross-curriculum committee to coordinate the specific projects planned for the trial period. There is also a brief discussion of Internet ethics: “To minimise the likelihood of girls being exposed to inappropriate material . . . no girl may access the Internet outside classtime without written permission from her parent or guardian.”

As well as the newsletter which always has something about developments in regard to technology, an A4 sheet titled “Computing Curriculum” is given to all parents. Under the heading “rationale”, the document explains that the school introduced its computing program in the late 70s: “From the outset, the school recognised that students needed to use computers in a wide range of subjects so that they could appreciate the universal nature of the computer. With a “Computers Across the Curriculum” approach our students will acquire skills that will equip them for future studies and careers.” The policy, parents are told, is to teach computers within the traditional subject areas and for those students who wish to specialise, elective courses in computing are offered.

Attention is also given to staff training and development. The parents are informed of the school's commitment to encourage and support staff so that they develop personal computer skills so that they can confidently teach using the computer in their own subject areas.

Parents are advised that they can purchase Apple computers at wholesale prices through the school and that certain packages are recommended to be compatible with the school's software use. They are also told of the school's laptop library, the multimedia Workshop for highend graphic work with video and photography, the fast broadband connection to the Internet which allows the school to trial new technologies like video conferencing, virtual reality and online assistance in a variety of subject areas which is located in the library. And finally, there is information about the school's computerised library which is accessed in the library itself and in other locations throughout the school and that there is a CD network which gives students access to 14 different databases.

Besides the overall policy, there is also a page-long document called “Computer Literacy” directed at a parent audience. Its aim is that “students are experienced in the latest technologies and that each student acquires competencies and confidence to use technologies efficiently and effectively within their school studies and in preparation for future study and work demands”.

This computer literacy document evolved from questions such as: What sorts of computing skills should students have by the end of Year 10? Should they be able to do a computer presentation incorporating graphics, text, pictures, sound, movie clips—either for a class or for interactive use with a group?

The document explains that the “across the curriculum” approach to computer use is integrated and student-centred. It aims to provide each student with what is called a “toolkit” of software skills and, hopefully, the confidence to apply the skills to meet

learning demands. Adaptability to hardware and software variations is supported to enable students to work across platforms. The planners believe that creativity and teamwork are balanced with purpose through open-ended subject specific tasks.

The school's approach, it is argued in this document, is ever-evolving and relies on a strong supportive culture involving all students and teachers with access to use when required and subject teacher involvement at all levels. By the time a student reaches the final year of study, either the Victorian Certificate of Education or the International Baccalaureate, it is hoped that each possesses a software toolkit and the ability to apply such skills purposefully.

The basic tool kit includes:

- word processing;
- spreadsheeting;
- graphic design and drawing;
- desktop publishing;
- multimedia presentation;
- multimedia authoring;
- Internet researching;
- Internet communications.

Super Toolkit

- scanning;
- printing;
- using CD-ROMs for research;
- Internet accessing;
- digital photography;
- sound and video recording and editing.

The document spells out that the school coordinates the skills development across subjects to ensure that tasks increasingly call for higher order skills. The aim is that subject teachers work closely together to ensure that subject requirements are met. A good example of the implementation of this policy is the focus of this case study—the multimedia project in Year 7 Art, History, Geography and English.

In recognition of “everchanging technology”, the computer literacy document argues that it is important for students to learn to be adaptable. Students with IBM computers at home are supported to do word processing and spreadsheeting work on both Macintosh and IBM machines. New technologies are assimilated within the curriculum structure as they become available and are assessed as to whether they are educationally worthwhile.

New students are assessed for their literacy. For Year 7 students, who arrive with an ever-increasing range of backgrounds, a special program is undertaken at the start of the school year. All new students receive individual assistance in addition to peer support. Teacher support is also available.

The Computer Literacy document speaks to a student/teacher/technology relationship. The computer is seen as an invaluable tool for subject work:

Drafting essays and modelling mathematical problems without the appropriate software package would be ludicrous. It is important that the computer be used purposefully. To this end teacher professional development provides teachers with the appropriate decision making skills to lead and work with students. An open-ended student-centred approach also enables new enhanced learning outcomes as student creativity is encouraged. The school's approach is a careful blending of past values, meeting present responsibilities, and preparing each student to take advantage of future opportunities.

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 IT 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.

The English Department has no explicit policy on the use of technology. However, somewhat similar to the Victorian Curriculum Standards Framework (CSF) (Board of Studies, 1995a), there are broad-brush references in syllabus statements to the importance of technology. A number of members of the English Department are active in the Victorian Association of Teachers of English (VATE). Their ties with the professional association mean that the school has access to journals, in-service opportunities and conferences. The National Statement (Curriculum Corporation, 1994a), National Profile (Curriculum Corporation, 1994b) and the Curriculum Standards Framework (Board of Studies, 1995a) are used as the basis for the English curriculum. At year level meetings, technology and its possible uses in English are on the agenda.

#### **4. The practice**

This snapshot centres on the Year 7 multimedia learning environment program. As is often the case, a particular individual was instrumental in the conception and preparation of the implementation of the program. The Head of IT at Ealing Grammar is very concerned that learning issues are foregrounded in all computer use at the school. It is of interest to note that he is doing his PhD, investigating the processes of change and technology by focusing on cultural and social factors. When the program

was being conceived, he prepared a document to outline his objectives. Included was a rationale which noted the educational advantages of a multimedia learning environment:

“The development for students and teachers of group learning strategies; presentation and communication skills; technology skills within subject context; constructivist and peer learning opportunities; teacher inservicing in technology; students coming to see information as more than just linear text.”

He was interested in how you go about changing a culture. He argues that for there to be significant change then the whole culture needs to be involved, hence the focus on Year 7 and then incremental curriculum initiatives at each successive level, aimed at building on what had come earlier. The outcome at Year 12, according to the Head of IT, would be students and teachers who are confident and adept with the use of the new technologies in all curriculum areas. He argues that when the project comes out of the normal curriculum framework, the final product means more and is richer for it. If the concentration is on the technology alone, then it's more fragmented, not integrated and not connected to the education process. If by the end of Year 10 the students know how to use computers across the curriculum, he argues, they are better equipped to face Years 11 and 12.

The Year 7 multimedia program began in 1995, so I saw it in its second year. The objective was for Year 7 students to develop multimedia skills in a number of subject areas: Art, History, Geography and English. The students used Hypercard to incorporate text, Quicktake photos, video clips, sound and animation. I observed English classes in the fourth term of Year 7.

Earlier in the year, in the History component, the students worked in small groups to produce a Hypercard stack on an aspect of the school's history. The aim was for the students to develop confidence in historical research, team-work skills, project management and to learn how to use the technology to present their work. Each group presented its stack to the whole class, explained how they put the stack together, the resources they used and the challenges they experienced. They used either a large monitor or a Proxima Projector to show the stacks.

Students asked the same questions as in the past but in a different medium. Teachers believed that there was a richness evident in the products. The students engaged effectively in teamwork, problem-solving, research presentation, design, how to produce artwork, scan, put in a voice recording, transferring research data into computer form.

In the year 7 Geography component, the students went on a field trip to the Victoria Market and to the Melbourne Cemetery. They investigated different ethnic groups, languages, jobs, professions, family histories and compared migration patterns, past and present. During the trip they gathered information using video cameras, digital cameras, normal cameras, cassette recorders and took notes. In groups, they produced a stack for each part of the field trip.

In English, students produce a short hypercard stack designed like an interactive story on a modern myth or legend. The students are encouraged to use their imagination in writing, graphics, promoting interactivity and effective design to produce an entertaining story. The emphasis in the English project was to provide opportunities for the students to be creative, not simply to be acquiring skills in the use of multimedia technology.

Before the English teachers actually took the Year 7 unit using multimedia, they had six lunch-time inservice sessions with the Head of IT. The Head of English described a range of response and skill acquisition, but pointed out that when the unit was in process, further support was made available to the teachers.

At the end of the year, the students felt a great sense of achievement. The experience confirmed for the participating teachers that multimedia is a tool for learning and it strengthened their resolve that it should be in the curriculum for all students. The aim was for all the students to acquire skills and understanding and even though the rate of learning was different for different students, by the end of the year most of the students were competent with the technology.

But there was also some concern. One of the English teachers said that all the teachers involved felt there was too much emphasis on graphics and drawings and not enough on the text. As a result, a number of the teachers required the students to pay more attention to the development of the text. One of the teachers felt that it was most useful in developing an understanding of narrative structures. Two of the teachers felt that desk-top publishing and word processing had clear application in English but that multimedia seemed to be less directly relevant. One actually said that at one stage she felt that it was the technology driving the curriculum—a contradiction of the school's overt policy and approach. This particular teacher also felt that the technology was still an add-on to the demands within English and not integral. She argued that multimedia was different to the inclusion of film in the English curriculum as film had a context and theoretical base as an aesthetic medium, whereas multimedia still didn't. But she acknowledged that as the number of multimedia products grew then it would assume a different status and would need to be included in the curriculum.

Despite the school leaders' emphasis on the availability of resources within the school to support learning with the new technologies, many of the teachers interviewed wanted more. The time factor came up over and over again: there is such competition for a place within the English curriculum that some felt resentful that the multimedia program was occupying an excessive amount. And absolutely central to the tension is the question: Is multimedia English?

I was told that the issue surrounding the use of technology for literacy purposes was not often on the agenda in English Department meetings, even though individual teachers told me that they believed that the new literacies (Snyder, 1997) associated with the use of the new technologies was of great importance to subject English.

The students also offered their perspectives on the multimedia project. Of the four Year 7 girls interviewed none had gone to Ealing Grammar primary school and none

had had much exposure to computers before coming to the school. They all welcomed the attention given to technology at the school. Only one of the four, all of whom had computers at home, was actually using the technology to talk to young people in other parts of the world. This particular student wanted more freedom in the use of the different applications. She wanted to be given the opportunity to explore the applications independently. She wanted teacher intervention only to explain error messages and problems that seemed insoluble. Another student liked multimedia as she sees it as “a better way of connecting information”. She saw value in the emphasis on the use of technology. She not only found it enjoyable but also potentially valuable for post-school work and contexts. She sees a future that is technology dominated.

### *Snapshot of class one*

The computers are situated on three long tables extending across the width of the room with three computers on either side of the table. Along the three walls of the room, excluding the front wall, there are also computers: between six and eight along each wall. The boards in the room are covered with examples of students’ multimedia achievements. The students are all working individually at their computers, the talk level is low, a few ask for help—either another student or the teacher. There is a high level of engagement and concentration; the students work purposefully; no one moves around the room; the sounds are mainly computer-generated: the click of the mouse, keyboards, activated sound cards. The Computer Awareness teacher moves around as a consultant, a trouble-shooter. When students want her help, they raise their hands and wait patiently till she comes over. There is not much interaction between students; they seem hell-bent on completing their work.

It is not exactly clear who is the teacher and who is the learner. Knowledge seems to be centred in the students. The teacher is an important resource. Her manner is confident and she responds quickly to student queries. She uses the language of technology and it seems to be a shared language: both the teacher and students use it. There is no freewheeling in this class. The students are focused on producing their multimedia version of a myth. They are self-motivated, involved and focused on the task.

The teacher is responsive to the needs of the students and to any difficulties that they encounter. She is on the go the entire lesson, always watching for students who need help. She is both confident and competent with the technology. She explains to a student how to create a folder in which the stack will be located. She takes a piece of paper and sketches the folder and what it contains. She “represents” what she is explaining. She talks to the student, but she also listens to her.

The demands on the teacher are high. As she explains about the folder, two other girls have their hands raised. They don’t seem to consider the possibility of asking other students for assistance. The teacher observes these students but doesn’t get flustered but also doesn’t suggest that they consult peers.

### *Snapshot of class two*

There is no formal beginning to the lesson. The students walk in, switch on their computers and get right into the multimedia task. The technical assistant asks very early on whether or not there are any problems. One student asks how to put in an icon and a friend shows her how. The kinds of questions asked in this class are different from the first which was taken by the Computer Awareness teacher. In this class, the questions seem to be more English related, more about the text and how to produce it. The students in this class are more interactive than in the first. They talk to each other about their evolving texts. Yet in response to the request that everyone be quiet as one group were trying to record sound, there was immediate silence and a few takes were recorded.

The atmosphere in this class is more relaxed but less productive in terms of progressing with the development of the multimedia story. Whether or not more or less learning is going on is difficult to determine. Some of the talk is dedicated to a discussion of the different media employed to create the stories. However, it seems that the students in this group completed a draft of the story before they created the multimedia environment.

It is fascinating to observe the girls staring at their screens, seemingly hypnotised. The eyes are focused as the hands work the mouse; the deep concentration and intensity of the gaze, the drawing power of the screen. It is as if the screen is a magnet. It is as if you can see them thinking.

### **5. *Distinctive features of the practice***

The Principal of the school does not intervene directly with policy regarding technology. He has particular trust in the Head of Computing, the Head of IT and the Curriculum Coordinator, all of whom work together as a team, who in turn work with different groups of staff. This triumvirate, three people who form a triangle of connection, works to implement change. By identifying a key person within each subject area and working with these individuals in the development of skills with the new technologies, they initiate change and development within particular curriculum areas.

The Curriculum Coordinator stresses the importance of the existence of a learning community within the school which is enabling for change to happen. She points to the PEEL (Project for Enhancing Effective Learning) (Baird & Northfield, 1992) group which is strong at the school. She believes that the PEEL group sustains and nurtures the maintenance of the learning culture. The Head of IT also stresses the importance of curriculum and learning—that access to the best cutting-edge technology doesn't necessarily mean that the best learning will take place. A powerful yet informal way in which teachers learned about the potential of the new technologies within the school environment was simply to find someone who could do what they wanted to learn and then learned how from them.

One of the librarians has taken the initiative to work closely with teachers across the curriculum in encouraging their use of the Internet with students. There was a lot of



preparation and groundwork done before the enhanced facilities, now a feature of the school, were set up: meetings, discussions and exploration of the potential of the Internet in particular subject areas. Before the direct cabling, there were only three connections—the staff room, the library and the Curriculum Coordinator's office. When the project was initiated, the Head of IT and the Head of Computing both gave presentations at school assemblies. They used the big screen and demonstrated what you could do on the Internet and where you could go. Then a carefully timetabled introduction to the Web conducted by the librarians was implemented: all classes from 7-12 were introduced to the Internet.

When the Curriculum Coordinator, who also teaches Year 10 History, talks about the use of the Internet, she explains that teachers never invite students to “run rampant” looking for information. She describes the unit she did on the American Civil War. The teachers plan together a focused way for the students to get started. Only then may the students branch out to what they want to pursue. Her belief is that there are plenty of opportunities to simply play and have fun outside classtime.

Furthermore, she explains that the Internet is used as one of a number of resources, not exclusively. When the Civil War assignment was set up, for example, the students were told that they must use a range of resources. And when they do use the Internet, it is with skill: knowledge of different search engines, how to save information to disk, how to save bookmarks to disk, how to use folders to group information, how to take notes from the documents they download, using Word at the same time as they use Netscape. The students, who have a greater affinity for the visual, are thrilled with the access to the photographs about the period available on the Internet.

The Head of English sees potential in the development of a Homepage for English at the school. She has spent some time looking at school sites on the Web to see what kind of presence English teachers have and has encouraged other English teachers to also look at them so that they can choose a direction for themselves. It seems that there are two major forces at work within the English Department: resistance and cynicism on the one hand, and enthusiasm and vision on the other. The Head of English proudly told me that the English Department was the first to use part of its budget to buy a laptop and modem for the members to take home. But another English teacher strongly believes that using the new technologies simply wastes valuable time.

Also distinctive about the practice within this school is that full recognition is given to the importance of technical support within classes and in-house professional development programs. Another special feature is that the teachers have the opportunity to “rehearse” a technology project at least one term before it actually runs. The Year 7 multimedia program, the focus of this case study, is a prime example of this approach.

## **6. *Issues and implications***

This case study raises a number of questions:

1. What is the place of the visual in English?
2. What kind of leadership is required to promote change?
3. Whose responsibility is it to teach technology skills?
4. Is the use of the new technologies best accompanied by an integrated approach to curriculum?

The rest of this section explores some of these issues and how they are played out in this particular school.

It seems that the English teachers are the most resistant to using the technologies. They also complain the most. With the multimedia program, they feel that the text is all important and that the students waste too much time with the visual information. They still regard the visual as secondary to subject English. In the Curriculum Coordinator's view, English is somehow a special case. She believes it is because there is a tendency to protect what is traditionally regarded as the territory of English: the book and the spoken word. She points out that it is only relatively recently that English teachers have incorporated film into their curriculum programs.

Her personal solution is to "inspire" the English teachers and to supply the "adrenalin". She believes that the new forms of literacy will be as significant as television and that English teachers simply have to understand the fact that literacy involves multiple ways of meaning. She is not worried if English teachers continue to privilege the printed text as long as they acknowledge and understand that other forms of text are also possible, important and must be included in the English curriculum. When pressed for an explanation of why the English teachers were the most resistant, she suggested that perhaps it is so inculcated in them that the correct use of text is the printed text and that somehow it threatens their professional integrity, even their sense of power, if this is challenged.

She argues that the English teachers have to be involved as they must extend their responsibility of teaching critical skills to these new spaces. But at the same time, there is a recognition at the school that all teachers across the curriculum are responsible for teaching students critical literacy skills—to question texts, authors and to assess the credibility of sources.

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. We know that this is not the best recipe for teacher change—that mandating change is not particularly effective (Fullan, 1991). The Head of English depicts some of the English teachers as "a bit suspicious". Some are more interested in the potential of the Web than in multimedia—perhaps they are not seeing the direct connections between the two—that the Web is hypertextual in form (Burbules & Callister, 1996).

The Head of English also points out that English teachers traditionally are more critical of new practices and interrogate their value and potential before integrating them into the curriculum. Further, they see as their responsibility the teaching of critical evaluation skills. The Head of English suggests that for some, it is difficult to see just

why multimedia is of importance in the context of English. But at the same time she says that even though she is a bit of a snail, she has in the past year, bought a laptop and a modem and is connecting each day and already thinking about how she will use these technologies in her program for the coming year. She says that all the English teachers are excited about the Web's publishing potential: real audiences, students being able to create hyperlinks to other texts and feedback, sometimes instantaneous, from readers.

A tension, apparent it seems whenever technology is used outside of subject Technology, is in the degree to which teachers are teaching the technology perhaps at the expense of the limited time allocated for their particular subject. If we take into account a premise intrinsic to the theoretical underpinnings of this project, that there are complex interconnections and interdependencies between technology and literacy (Peters & Lankshear, 1996), this becomes perhaps a non-issue. Knowing how to use the technology is part of being multi-literate. However, it still takes time to learn how to use and then to actually use multimedia technologies for particular projects and they see this as a problem. This is despite a widespread feeling in the school of satisfaction with the level of resources, professional development opportunities, absence of constraints to experiment with curriculum innovations, staff support and student interest and motivation.

But at the same time 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. The understanding is that it is the school's responsibility to prepare students for the world beyond school and that technology is central to that world. The Computer Awareness teacher for Years 7 and 8 talks specifically of 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—these represent the new literacies that students need to cope in a changing literacy world.

The Curriculum Coordinator sees such tensions as transient. In her view, the teachers will soon feel comfortable with the use of the technologies across the board. She predicts that in five years time students and teachers will elect to do presentations in the most appropriate medium. If it happens to be multimedia, then that will be the format of choice. But she is careful to emphasise that she can only envisage this happening if the policy of support and professional development opportunities for teachers persist.

The Curriculum Coordinator believes that key people who act as movers and shakers are central to effective change processes but they must be key people who can listen. The school's leadership team represents a variety of people: some for the technical needs, some for inspiration, and some with both. But again what is always stressed is the importance of the networks of a learning culture that thrives at this school: collaboration, sharing, talking through problems and opportunities to be critical and to complain about particular directions.

The Head of IT makes comparisons with the developments of the early 80s in terms of technology. He believes that teachers missed the opportunity at that time. Here we have another chance with hypertext and multimedia. It will be of interest to see whether it does make a difference to learning. He believes that the technologies have that potential but for it to be realised the teachers have to be prepared to change. He's particularly interested in the changing relationship between teachers and students. The computer has the potential to shift things, but it doesn't happen without teacher cooperation. He believes that teachers have to change—there is no choice.

The Head of IT also observed that the extent of the take-up of the technology by individual teachers varied and that there wasn't much he could do about that. For example, in the Year 7 multimedia project, some of the teachers learned a little and then said that the students could do the more advanced requirements. Others expressed a desire to learn more themselves so that they could be as technologically proficient as the students if not more proficient.

The Computer Awareness teacher was pushing hard for an integrated curriculum at least at Years 7 and 8. She argues that the use of multimedia makes no sense unless used in the context of an interdisciplinary approach to teaching and learning. She also argued that even as the Computer Awareness teacher, she did not feel compelled to be expert with the use of the new technologies.

When I returned to the school six months after collecting the data to discuss with the key informants their responses to the first draft of my write-up, I learned about a number of interesting developments. First, as a result of the Year 7 multimedia project, the Head of English had become so engaged with the possibilities of hypertext in the teaching of literature that she had asked her Year 11 students to design webs in response to the text under study. She emphasised to me that the literary text was still at the centre of her work with the students, however, she was now encouraging the students to use a range of media to explore the meanings of the text and its connections with other texts. Second, the English teachers were planning to develop Web pages with their classes which would serve both as professional development for themselves but would also represent a curriculum initiative. The Head of English had transformed from a person who was perhaps appropriately sceptical and cautious to quite an enthusiast, using the Internet extensively for own purposes not just for school-related projects.

## **7. Conclusions**

It would be easy to dismiss all that can be learned from this case study as the direct product of privilege. Of course, it is undeniable that Ealing Grammar is part of the private sector which serves only thirty per cent of Australian students, and that within that thirty per cent, Ealing Grammar belongs to an even smaller group of privilege. But it would be shortsighted to assume that richness of resources make anything possible. There are examples of similarly well-endowed schools across Australia which have not been as successful in their implementation of the new technologies into curriculum practice and this is despite the fact that most private schools now use

technology as a selling point. Indeed, with only one computer per four students, there are at least some competitors within the public sector in terms of resources.

There is much to be learned from this school's approach but 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, inhouse 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.

Yet the school is relatively quiet about its achievements. Despite the fiercely competitive private school environment in which schools often use technology policy and availability as the major enticement for potential clients, Ealing Grammar does not appear to seek public promotion. But on the other hand, spots in the media about the school's achievements can be beneficial for the educational community to learn about the approach to technology. At the end of 1995, for example, the Curriculum Coordinator and a Year 7 student were interviewed on a radio program, and talked about the Year 7 multimedia program. Kate, the student, explained what making a multimedia presentation involved and how the technology worked. She told the interviewer that the students used a range of software applications to make a "book"—an autobiography: front and back covers, blurb and hot buttons to move from layered detail to detail. When asked whether it was fun, Kate replied that if she could she'd use multimedia all the time,

"because we could do everything we wanted to do because we could use audio and video and lots of different pictures and lots of different things that you couldn't do just using cardboard and pasting pictures on it. Because instead of it being a 2-D thing, it was more 3-D, where you could go into the depth of the whole thing and just do anything you wanted to do. So most people I think would choose multimedia over just doing normal projects. Well it would become normal then."

The Curriculum Coordinator explained the purpose of the project: that the students will be able to use any form of software as a tool for learning:

"a calculator of the mind that can do a whole range of quite extraordinary things".

She noted above all else the students' enjoyment in the project:

"The level of enjoyment quite staggered us and the level of enthusiasm. For the first time I guess for many years, I've seen girls in their computer laboratories at lunch time and recess time and after school and before school—they can't wait to get there. You know, learning has become really fun."

She also stressed that the teachers found that the students who perhaps had not been too successful with print forms of presentation or the more traditional forms of

presentation were able to shine with multimedia and that was another joy for the teachers. Where they may have been having trouble writing the standard form of essay, when they have an opportunity to present their own artwork or their own soundwork or their own graphs that they'd put in, the range of possibilities helped many which was exciting for the teachers.

This interview is interesting from several perspectives: first, what the student and teacher had to say about the project and the implications of their comments for the use of IT in English, and secondly the role of public discussion of these issues conducted in a thoughtful, hype-free context. A student suggests that being able to express yourself in three dimensions is powerful and desirable. And the teacher claims that the use of these technologies is adding a level of engagement and interest in the class that is not always present and certainly needed for effective learning to occur. We need more instances in the media of intelligent discussions of the complex issues involved when a culture engages in a major shift. We need less hype and more considered analysis. Schools like Ealing Grammar can play an important role in contributing to our culture's thinking about and participation in the enormous changes in which we are all complicit.



## ELMWOOD: TECHNOLOGY IN TRANSITION AS A KEY LEARNING AREA

### 1. *The study at a glance*

This study considers literacy practices in the context of a Year 9 Agri-Technology class at a large suburban high school in a mainly middle class area. 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 was a Garden Project to be undertaken at home. The project involved a rich array of literacy activities intrinsic to the design, make, and appraise procedural logic of KLA Technology.

The Garden Project helps redress an important balance in our thinking about technology. It directs our attention to technology as a vital mode of human practice, and away from more commodified concepts of technology as (especially electronic) *technologies*

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-strapped schools) of thinking about technology and literacy from a wider perspective than the application of “up-to-the-minute electronic technologies” is addressed.

### 2. *The site*

Elmwood is a state high school located in an outer suburb of a state capital. The school has extensive grounds. This space is expanded still further by undeveloped bushland surrounding its boundaries. A creek runs through the school grounds, and the landscaping reflects the native vegetation of the surrounding area. The suburb of Elmwood is relatively recent, with new pockets of development being opened regularly. Houses are characterised by extensive landscaping, and are most often built to take advantage of views over the surrounding bushland. It is a comfortable, leafy suburb; gardens and houses are well maintained, pockets of parkland dot the streets, the nearby mountain range hovers as a backdrop to the school.

Preliminary figures from the 1996 Census identify Elmwood as having a relatively young population whose income level and rate of home ownership is considerably above average for the state. The median age of 29 years compares with the state average of 33 years and Elmwood ranks 399th out of 448 local statistical areas. Elmwood’s median weekly personal income of \$382 far outstrips the state average of \$286 and the suburb ranks 52nd among local statistical areas. The rate of full home



ownership for the suburb was 40.6% by comparison with the state average of 38.7%. On this dimension Elmwood ranked 228th among the local statistical areas.

Approximately 1500 students attend Elmwood High School. This study focuses on the Agri-Technology course taken by 300 students from Years 8 to 10. The rapid growth of the suburb is reflected in the combination of permanent and temporary classroom buildings located on the site. Agri-Technology classes are held in two buildings used also by Physical Education classes. One building is permanent and contains one classroom, one workshop, staff room and staff work area and toilets. The other is a temporary, "demountable" building comprising two classrooms. This temporary building was vandalised and extensively damaged by fire during the period our study was undertaken. At the rear of the Agriculture buildings is a fenced area set aside for students' gardening and agriculture activities. At the time of our study most of this area was being used for vegetable gardens and crop field trials. Equipment and housing used in animal husbandry projects is also located in this area. A further one hectare of farmland is located across the creek.

In 1995, Elmwood upgraded its Junior curriculum to approximate the eight recognised and agreed Key Learning Areas. The Statement on Technology for Australian Schools (Curriculum Corporation, 1994c) identifies KLA Technology as bringing together different areas of study including Agriculture, Computing/Information Technology, Home Economics, Media, Industrial Arts and Manual Arts, Design and Technology. At Elmwood, KLA Technology subsumes traditional subject areas of Agriculture, Business Education, Computer Education, Home Economics and Industrial Arts. These subjects are now known as Agri-Technology, Textile Technology/Food and Textile Design, Industrial Design, Business Education and Computer Education. Development of this new curriculum was instigated by a group of teachers including Victor, the teacher of the class described in this study. Victor participated in a one day training session run by the Technology Education Federation of Australia (TEFA) in 1995. He features in support materials designed to introduce teachers to the KLA-Technology and published by the state education department.

During our visits to Elmwood, Victor's classes were held in a variety of spaces. Some were conducted in the classroom of the permanent Agriculture building. Others were held under a huge fig tree close to the building. Some lessons were characterised by a short interlude when the group adjourned to the vegetable gardens outside, to observe progress, to discuss gardening practicalities, or to allow Victor to illustrate a teaching point.

The class providing the focus for this study is Year 9 Agri-Technology. They are implementing "The Garden Project". The following table locates this project within the overall Technology curriculum area developed by the school.

Year Level	Subject Area	Subject Projects	Year Level	Subject Area	Subject Projects
8	Industrial Design	<ul style="list-style-type: none"> <li>• Camp Stool Project (wood)</li> <li>• Acrylic Design Project (plastic)</li> <li>• Cash Box Design (sheet metal)</li> <li>• Metal Design (steel)</li> </ul>	8	Computer Studies	<ul style="list-style-type: none"> <li>• Keyboarding, Computer operations (Basic)</li> <li>• Word processing, Desktop publishing (Basic)</li> <li>• Spreadsheets (Basic)</li> </ul>
9	Business Education	<ul style="list-style-type: none"> <li>• Business and personal financial record (single entry)</li> <li>• Business Knowledge</li> <li>• Computer accounting (Introduction)</li> <li>• Spreadsheets</li> </ul>	9	Textile Technology	<ul style="list-style-type: none"> <li>• Personal mark/sign on paper</li> <li>• Personal mark/sign in fabric and subsequent construction of class project</li> <li>• Home decoration project</li> </ul>
9	Agri-Technology	<ul style="list-style-type: none"> <li>• Animal Husbandry–The Poultry Project</li> <li>• The Garden Project</li> </ul>			
10	Business Information Processing	<ul style="list-style-type: none"> <li>• Business Financial Records (Double Entry)</li> <li>• Computer Accounting Systems (Double Entry)</li> <li>• Business Knowledge</li> <li>• Computer Software Applications (intermediate and advanced)</li> <li>• Computer Programming</li> </ul>	10	Food and Textile Design	<ul style="list-style-type: none"> <li>• Home Decoration Project</li> <li>• Item of Clothing</li> <li>• Formal Cake</li> <li>• 3 Preserves</li> <li>• 3 Items of Confectionery</li> </ul>
10	Agri-Technology	<ul style="list-style-type: none"> <li>• Animal Husbandry–The Calf Rearing Project</li> <li>• Sustainable Systems</li> </ul>	10	Industrial Design	<ul style="list-style-type: none"> <li>• Cake slice</li> <li>• Foot stool</li> <li>• Trophy Design</li> <li>• Hobby box</li> <li>• Bowl</li> <li>• Electronic dice</li> <li>• BBQ Scraper</li> <li>• First Aid Box</li> <li>• Folding Shovel</li> </ul>

### 3. The policy context

In 1995, Victor was asked by the school to work within a team to set up a Technology Department. He received a small grant from the state education department to facilitate the development of the KLA Technology in the school. There have been

many structural changes within the state education department, including the establishment of a statutory body, which has the responsibility of developing statewide syllabi for use in private and state schools. The timeline for the development of a Technology syllabus schedules the introduction of the syllabus for January 2000. Meanwhile, curriculum officers within the department are developing inservice and support materials that will raise the awareness of the KLA Technology within schools. Schools like Elmwood, who decide to develop a Technology curriculum, rely heavily on the National Statement and Profiles.

The Statement on Technology identifies four interdependent strands of learning: namely, designing, making and appraising; information; materials; and systems. "Students' tasks and activities in technology are [to be] directed at developing their knowledge and skills in each of these strands of learning" (Curriculum Corporation, 1994c, p. 5). The central organising principle of learning in KLA Technology is expressed in the Statement as follows:

"All learning in technology involves the Designing, making and appraising strand. The relative emphasis on the Materials, Information, and Systems strands varies according to student needs and the nature of their program and activities. In some programs, all three strands may receive equal treatment; in others, one or more may be emphasised.

Technology programs can be structured and presented either as discrete programs or combined with other areas of learning. The balance will vary in response to the requirements of the subject matter and the learning needs of students, as well as in response to conditions and resources." (Curriculum Corporation, 1994c, p. 5).

In the case of the Garden Project at Elmwood, Victor acknowledged his reliance on the agreed Statements and Profiles in developing the school's technology program. "Before the profiles I didn't know what the technology model was or what technology was, people talk about technology as computers but it's not."

Because there was no syllabus, Victor was "not worried about content but understanding, . . . he has "replaced traditional teaching methods of using an OHT, copy that down, with students' own discovery learning and inquiry approach, not according to syllabus or massive work program of content, content, content."

He also commented frequently on the lack of accountability; absence of a syllabus resulted in a freedom to investigate the concepts of KLA Technology and develop a work program that suited the needs and interests of the students and school, and his teaching colleagues, as well as the availability of resources at the school. In developing the program, Victor relied heavily on one particular text, *Approaching design and technology*, (Wright & Royle, 1990), an English text designed to assist teachers to develop work programs for the National Curriculum Technology in that country.

At the time of our observations, the lack of systemic requirements, and formal syllabus

documents was reflected in the lack of a formal Technology policy at Elmwood. Recently, Victor and other teachers have produced a curriculum profile for Technology at Elmwood. Its overall aim is to provide a broad general education in Years 8-10 where learning outcomes are designed to prepare students for a place in society and to provide a foundation for subsequent learning. This is somewhat broader than the purpose expressed in the Statement on Technology which is “to prepare students for living and working in an increasingly technologised world and equip them for innovative and productive activity” (Curriculum Corporation, 1994c, p. 4).

The school statement also explicitly places the development of Technology at Elmwood within an overall approach to gender equity. According to the school statement, the teaching of technology in the past has often been too teacher-directed. Moreover, it has often emphasised narrow, gender-determined skills for students. In the case of women, this had restricted choices for options after school, constrained experiences for dealing with diverse technologies, and undervalued technologies associated with women’s work. Correspondingly, males often lack experience in and respect for home based technological processes. The curriculum profile recognises that in the context of changing roles of women and men in Australia, and the changing nature of paid and unpaid work, it is important that all Australians be competent in using diverse technologies. The profile emphasises the need for curriculum to address perspectives and values of women as well as men and their respective contributions to developing and applying technology. At Elmwood, the technology area takes into account diverse culture, experiences, locations and backgrounds, and explicitly links school learning to technologies in homes, workplaces, recreation and personal needs and interests.

Despite this Garden Project being formally a component of KLA Technology it was also very much a context for learning and practising language and literacy along key lines of the Queensland English Syllabus. Victor claimed no knowledge of the school English program or policy and assured us that the English policy dealt with the subject English, and therefore had no relevance to the Technology program. He had not consulted the policy, or relevant staff members when developing the Technology program, and did not know of any connections between what the Year 9 students did in English, and what they did in Agri-Technology. As the study unfolds we will find, notwithstanding these claims, what we observed was a unit of work that at the level of formal intent was often exemplary in its contribution to language and literacy education across the curriculum. For example, learning activities exemplified reading, writing, speaking and listening—production of texts—in the context of real life and life like social practices characterised by purposes associated with “‘mature’ (insider) versions of related social practices” (Gee, Hull & Lankshear, 1996, p. 4). Oral and written tasks and the worksheets provided for guidance, together with Victor’s oral instructions in classroom lessons, explicitly highlighted and modelled the generic structure of reports and procedures associated with technological productions and practices. Attempts to relate text to context, enact authentic social purposes and approximate to real life and life like practices within language and literacy education in subject English classrooms are often hampered by the narrow literature orientated base of English. The potential of subjects like Agri-technology, which have long been grounded in close associations with the world of work, to enable the kinds of values

underpinning Queensland's English Syllabus is considerable. In many ways, this potential was evident in the present site.

#### **4. The practice**

##### *(a) The human participants*

There were 32 students in the Year 9 Agri-Technology class: 18 girls and 14 boys. They were overwhelmingly white Australian born native English speakers. Nearly all dress in the school uniform, with the only outward display of sartorial individuality being a colourfully varied assortment of baseball caps, worn by both girls and boys. The students are well behaved, never surly or argumentative, good humoured in their acceptance of the quite strict disciplinary regime imposed by Victor. Most homework tasks are completed on time, and many of the students seem to be enthusiastic about the Garden Project. Our first observation of the class occurred during the first week of semester. Victor requested that all students wear name tags to assist him to quickly recognise them. This request was agreed to cheerfully and cooperatively.

Victor has been a teacher for twenty years, in two state systems in Australia. He has been involved in the various trials and models developed in Queensland for introducing KLA Technology into schools. He has written up his projects as case studies, had his lessons video taped, and has previously been the subject of other research projects. He is involved in research projects beyond his formal work context as well. While committed to the idea that research is a necessary part of the development of a body of scientific knowledge, Victor was less than enthusiastic about the time and personal commitment that is involved. He commented frequently on his heavy teaching load, and large class sizes. On the other hand, he recognised that one consequence of the way that the technology projects were developed was the lack of daily preparation requirements. Each lesson with this Year 9 Agri-Tech class was 70 minutes long. With the entire unit of work having been planned, developed and produced before the project began, Victor had little formal preparation to do before each lesson.

##### *(b) The non-human resources*

The project was presented to students as a structured and organised set of worksheets. Twenty five A4 pages laid out along a bench in a logically ordered sequence were distributed to students during the first lesson of the unit. The worksheet package fell into two categories. The first comprised information sheets that included safety rules, parent information and permission form, glossary, outlines of CoRT thinking skills and Technology models, and samples of students' work. The second group comprised sheets to be completed by students, and included a "tictac toe" type game, a series of questions on each stage of the garden project, a response sheet for a video, and a retrieval chart for use with a provided reference book. In addition to non human classroom resources, seeds, planting medium, fertilisers, plot of land or pots, reference books, gardening implements were required at home.

*(c) The immediate learning context*

The unit of work undertaken by the Year 9 Agri-Technology students involved designing, making and appraising a home garden project which, as intimated above, could be developed in pots, or as a hydroponic type, as well as a conventional garden bed. This garden had to accord with home and family needs and circumstances. Victor's students were required to establish the garden, after discussion and negotiation with parents. Making the garden at home was a stipulation by Victor. Other teachers permitted the garden project to be undertaken at school and at home, and at the time of our study a second group of students was using the school grounds for their gardens, under directions from another teacher. Victor, however, preferred the "real life" authentic practice of establishing the gardens at home. In contrast, many of his students expressed a preference for completing the work at school. Victor suggested their reluctance for home based projects arose from adolescent unwillingness to engage in discussions with their parents. Indeed, he suggested that many students found the parent/child negotiations and discussions the most difficult aspect of the project. These discussions and negotiations centred on issues such as site location, type of garden, and available money.

As with many secondary school subjects and courses, the type and format of assessment and evaluation methods was an issue for both teacher and students. The worksheets to be completed by students formed a major component of their assessment. From 11 worksheets that are completed either at home or during lessons, students were to select 7, including one compulsory piece, to be handed in at the end of the project. As well as the worksheets, each student prepared an oral presentation of their garden project and was expected to keep a Garden Diary, containing comments on the work in progress. A written test also was administered at the end of the project. Two pages of the worksheet collection were dedicated to assessment issues. The first was an Assessment Profile listing the assessment items and marks allocated to each item. The second was the Student Folio Assessment Profile, used by Victor to provide feedback to students on marks allocated for each worksheet submitted.

## **5. Distinctive features of the practice**

*(a) Literacy and Technology.*

The worksheets that largely framed and structured the Garden Project provided an important link between literacy practices and KLA Technology in the Elmwood site. Victor informed us that students must be "literacy capable" to pass Agri-Technology, although students with limited literacy and academic capabilities were not turned away. Indeed, Victor developed modified work programs for such students, to assist them in passing the course. At the time of our study the students enrolled in Agri-Technology had changed significantly from traditional cohorts. Increasing awareness of the current technological revolution and its significance for high value added production and economic prosperity has resulted in an "upmarketing" of KLA Technology. Current conceptions of Technology programs emphasise meta level

understandings and procedures, consistent with motifs like being a “clever country”, building a “smart workforce”, becoming a “creative nation”, and emphasising the roles of symbolic analysis and symbol manipulation in theory driven forms of design, production, marketing, management, innovation and the like.

These trends are reflected in the literacy requirements of the Garden Project, as well as in a changing student clientele for the subject area. While he had no exact figures to hand, Victor sensed “that kids enrolling in later units are more academically minded. Ag has been perceived as being let’s look after the baby animals. When they weren’t exposed to that in this current package that had an influence . . . It’s nice now to have the brighter kids”.

In response to this, Victor was trying to “build up confidence in reading and writing and research”, although “doing it in a more practical, realistic, fun way rather than from a textbook”. Victor observed that the nature and role of literacy within his subject area had changed during his twenty years as a teacher. “It’s more important now that it comes naturally rather than being forced—as a teacher becomes more experienced you become more aware of the importance of it rather than throwing an OHT up and saying ‘copy that out’”. In other words, the place of language and literacy within technology related learning is no longer inert (copying down) but rather is negotiated, enacted, acquired, and embedded within focused social *practices* of technology.

The Garden Project involved a wide range of language and literacy practices—oral and written—within the classroom and at home. These included 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 was to engage students in setting about the process the way “real practitioners” do in “real life”.

In addition, students completed a range of worksheets, maintained a diary, and completed an oral presentation of their project in class. Worksheets included such things as completing a specification and analysis report and a CAF (consider all factors) exercise. The specification and analysis report required students to generate a project design proposal using the design, make and appraise format. This provided a reasonably detailed description of what the student was going to do, examined the various aspects of the problem, and listed the important points to be considered (such as cost, time, size of garden, materials to be used). It recorded the process the student went through to arrive at their decision of garden type. This report incorporated their CAF deliberations, which were recorded on a separate worksheet. Considering all factors included ranking priorities, comparing individual priorities lists in small groups, and justifying and defending choices for top priorities. The diary component recorded the student’s progress through the life of the project. Entries were organised on a week by week basis with multiple entries expected for each week. Variables included “things I have done”, “things to consider”, “things I must do”.

By means of oral instructions and elaborations and printed handouts, Victor explicitly modelled the nature and requirements of literacy practices involved in worksheets, diaries and oral presentations. Examples of completed worksheets were included in

the handouts. The diary was made the focus of an early lesson in the project, and examples were provided. A formal note was included that a diary should be “brief”. Contents and accuracy were the key factors and presentation was not the main consideration. While a computer recorded diary was acceptable, it had to be presented in the student’s exercise book. In addition, Victor provided an oral presentation to the class, in conjunction with an information sheet listing the nine headings that he had used to structure his talk.

It could almost be said that in the case of the class we observed, these models were too successful. Many of the students produced almost perfect replicas of Victor’s models. This was especially apparent in the oral presentation, where each student was required to speak for at least five minutes on their completed garden project. Almost to a person the students used the same structure, sub headings, OHTs, and palm cards. Many even used the same or very similar sentences. For example,

“my brief was to design, make and appraise a . . . The timeframe was five weeks. It has to be completed by 2.12.96. The budget was . . . In the first week I . . . In the second week I . . .”

In some cases, students may not have understood the criteria that made a completed worksheet exemplary. For example when students were invited to show us their best worksheet and explain why they had chosen the one they did, the main reasons offered were

“neatness of writing; good writing; did it the best; more details; spent more time on it; lots of examples for each section.”

Of these only “more details” and “lots of examples for each section” accorded with Victor’s intentions.

At the same time, some students sensed a lack of scope for originality in some of the written activities, saying that

“you just have to write in a couple of words; just fill it out; you don't have to think about it; it's pretty basic; not really a challenge.”

To some extent these comments may have more to do with previous experiences of worksheets in other contexts than with the design of these particular worksheets. The majority of Victor’s worksheets provided scope for significant variation and initiative if they were seen in the way they were intended; namely, as examples of the practice rather than the sole exemplar of the practice.

*(b) Subject Technology.*

The technological focus of the Garden Project emphasises process over content. This reflects the conception of technology presented in the Statement on Technology for Australian Schools, according to which “technology programs in schools involve students in generating ideas and acting on them, as well as in using and developing



processes and products [i.e. “technologies”] that satisfy human needs (Curriculum Corporation, 1994c, p. 4). Victor said that “if students understand the system then it will help them follow the technological process”. For Victor, “the system” includes the design, make and appraise model, together with those ways of thinking espoused in CoRT (Cognitive Research Trust) procedures, which Victor had sought to incorporate across the entire school Technology Program. For example, Victor’s information worksheets contained four different kinds of flowchart describing the design process within the technology model. “Design, Make and Appraise” are key words that Victor and the students use all the time, words the entire Garden Project is based on. When asked to explain these concepts, Victor said,

“take all the words in your brain and think of ones that match “design”—you could think of lots of them- even use the words “make” and “appraise” within the word “design”—so to define it in just one sentence is rather difficult. It’s better to think of a whole lot of keywords for each. Everyone has different ideas of what those keywords are, so for me well design—pictures, plans, ideas, needs and so on—takes time to think of them. Make—dimensions, size, materials and so on. Appraise—judge, evaluate and so on.”

When asked to explain these concepts in relation to the Garden Project, students displayed shared understandings with their teacher. For example, when talking about design students said that design included, “where you put the plants and the garden”, “how you decide what to plant”, “a combination of ideas that you use to plan and design and what you have to make”. Conceptions of Making included “producing” and “constructing from your design”. Appraising was defined in terms of, “talk and see what plants grow better”, “judging the final result, finding out opinions”, and “evaluation—positive and negatives and comparing with others”.

Victor was particularly enthusiastic about the value of CoRT thinking procedures, developed by Edward DeBono. Elmwood had unsuccessfully sought to implement CoRT thinking across all departments. At the time of our study, however, Technology was the only KLA in which CoRT had taken hold, and then only within parts of the program. CoRT thinking procedures pervade Victor’s espoused philosophy of teaching, his units of work, and the learning materials and activities he produced. Indeed, the value and significance of CoRT in Victor’s view extended way beyond classroom applications. “It’s a style of speaking, I use it everywhere, I’ve taken it on in a serious way”.

One visible consequence of Victor’s approach was that students arrived at a view of technology which is very different from that which seems to prevail at present—where “technology” equates to tools, machines, gadgets and the like, and in particular digital technologies. According to Susie,

“I first thought technology was about computers, but when I was introduced to it in textiles, I saw that I could make projects a better thing by designing, making and appraising.”

*(c) Victor's pedagogical theory and practice*

Three characteristics stand out within Victor's conception of technology as a way of thinking about and operating in the world from a technological point of view. 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, was actively pushed by Victor beyond the confines of the classroom, and indeed, beyond the school. This was 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 was that the technological point of view should infuse people's approach to life as a whole

“what technology has done is they appreciate TV and things like that. I don't want to see them locked into a machine world, they don't appreciate natural reserves, they don't appreciate their backyards. I want them to appreciate plants and animals, and develop a more down to earth approach.”

Victor's view of the teaching approach required by this program was that activities will be student centred, and the teacher's primary role is that of facilitator. The Agri-Technology program, however, was still at an early moment in its development at the time of our study. Even at this stage however, its promise for future development was evident. We see possibilities for a fruitful dialogue between many of the ideas and aspirations expressed by Victor for his subject area and, for example, pedagogical approaches theorised and implemented by Robert in the Abbotsdale site study.

Notwithstanding the extent to which Elmwood's Agri-Technology program evinces a change in theoretical attitudes and approaches to learning, the pedagogical practice we observed was, in some ways, still rather didactic and teacher directed. The physical arrangement of the classroom remained quite traditional. Student desks were arranged in rows across the room, facing the teacher's bench, which was located on a raised platform. Students presented their oral reports from behind this bench and next to the overhead projector, which almost all students used in their presentations. Their roles as presenters resembled Victor's teaching approach, which, in the lessons we observed, was more that of didactic instructor than facilitator. In their presentations the student “teacher” stood at the front reading from prepared notes, referring to overhead transparencies illustrating their teaching points, and occasionally interrupting their delivery to pass artefacts around the class e.g., vegetable seeds, photos of the finished garden, soil samples.

*(d) An interesting anomaly—Steven.*

An interesting anomaly emerged within this site study, in the form of a student named Steven. He was a notable exception to the trend within Agri-Technology at Elmwood

toward increasing enrolment by more academically inclined students. Steven is a low academic ability student enrolled in special education classes where he receives help in his school work from specialist teachers. Steven had met with Victor and asked if he could join the Year 9 class, mentioning he would probably have difficulty with the literacy demands of the subject. He sought and obtained from Victor assurance that he would get extra help if needed.

He did, in fact, experience difficulties with both oral and written tasks as was especially apparent when he presented his final oral report. Steven had received help from a specialist teacher in writing up the worksheets and preparing the oral presentation. He spoke to Victor on the day and on preceding days about his presentation, receiving encouragement, guidance and advice. When it came to Steven's turn to present he moved to the front of the room and stood behind the bench next to the overhead projector.

He places a transparency on the projector, and fiddles with the focusing wheel. The diagram is very faint. Steven stands still, clears his throat a couple of times and appears to be waiting for the audience to attend to him. After a lengthy silence from Steven, the shuffling, giggling and muttering stops and every student looks towards Steven. He attempts to read the first line of writing from an A4 piece of paper. He stumbles over the words and stops. The class remain silent. Victor puts down the camera, and walks up next to Steven and says, "Would you like a hand there?" Steven nods. Victor says, "You stand here next to me and point to the diagram, OK?" Steven nods. Victor says to the class, "Steven has done a lot of work here, worked very hard on his presentation, so I'm going to read it for him." Victor reads the presentation. Steven stands behind him and looks over his shoulder following what he is reading. He occasionally points to the overhead transparency. When Victor has finished reading, he says "Can you explain the OHT to us please Steven?" Steven nods, turns his back to the audience so he is looking at the projected image of the diagram, and pointing to various parts of the diagram, makes some comments. No one in the audience can hear him. When he turns back to the audience, Victor says, "Thank you", and the class clap their hands.

Afterwards Victor seemed frustrated, and explained that a specialist teacher wrote Steven's presentation for him. The paper Steven tried to read from, was filled with the specialist teacher's writing, containing words and phrases Victor knew Steven would be struggling to read. Victor had previously suggested to Steven and the specialist teacher, that they prepare some key points in large print, using Steven's own words and handwriting. Victor had thought Steven would have been able to read such a set of points quite easily, and as a result could complete assessment requirements satisfactorily.

If we take the oral presentation according to conventional criteria, Steven's enactment failed at practically every point (overhead transparency, verbal delivery, reading from notes). On the other hand, when interviewed, Steven spoke knowledgeably about the KLA Technology model. His understanding of technology as social practice was as sophisticated as any other student in the class. He gave a convincing account of how he could apply the design, make and appraise model within his preferred future career

as a farmer, as well as describing the application of this model to the current Garden Project.

## **6. Issues and implications**

The Elmwood study helps illuminate five significant issues associated with school-based language and literacy education generally, and with respect to the interface between technology and language and literacy education specifically.

First, school-based language and literacy practices are often constrained within discrete subject areas when they can and should be extended fruitfully across the curriculum in ways that add value through appropriate transfer of knowledge and competence. Elements of practice at Elmwood provide useful clues here. We can, for example, look for ways of extending the potential in some of Victor's generic literacies within KLA Technology to curricular activities in other subject areas. For instance, in science, literacy is often conceived in terms of highly specific practices like writing up experiments. This, however, is to construct the literacy of science and the literate practices of the scientist in unduly narrow terms. By contrast, Victor's generic literacies, like "spec analysis" and "CAF", could be used by students and teachers to frame wider conceptions and practices of doing science and being a scientist from those which are often obtained. From this perspective, school-based communities of science practitioners could employ "spec analysis" and "CAF" literacies to frame, cost, and design scientific experiments and to conceive innovative scientific problems and projects within the processes of learning to do science; rather than—as is often the case—simply following pre-packaged and formulaic science programs based on textbooks or their equivalent.

Second, school literacies and the practices in which they are embedded often impede prospects for effective learning, by focusing too narrowly on *the child* and on the classroom walls or school gate as defining the parameters for *school learning*. This often results in what is commonly referred to as "doing school". Critiques of school learning emanating from community and work-based cultures increasingly insist that "the focus of learning and education is not children, nor schools, but human lives seen as *trajectories* through multiple social practices in various social institutions" (Gee, Hull & Lankshear 1996, p. 4). From this perspective,

"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)

To this extent, school practices and their embedded literacies—and here we must remember there is *no* literacy outside of *some* social practice or other—are often problematic. They readily assume distinctively "schooled" forms, which have either no place or a strictly limited place beyond school contexts. There are two important issues for school-based language and literacy education here. The first is the question of what the desirable relationship is between school and out-of-school

literacies and related practices. While critics of schooling seek more direct articulation, this does not mean they are correct. Maybe school literacies and practices should largely be for the sake of schooling. The issue, however, needs to be confronted. The second issue is contingent on the first. If there should be significant articulation between school practices—including their literacy components—and wider Discourses (Gee, 1996), how well in fact are classroom practices measuring up? To what extent is it true that school Discourses “separate learning from participation in “mature” Discourses” and, moreover, render the connection entirely mysterious”? (Gee, 1996, p.15).

Elmwood’s practices of language and literacy within KLA Technology reflect a conscious attempt to link what goes on in class to what actually goes on outside. Victor’s rationale for insisting on a home-based garden was, precisely, to provide students with real life and life like opportunities to practise “spec analysis” and “informed negotiation” in other institutional settings, and with other people (e.g., parents) who are at different points in life trajectories. How well or not this ideal was realised is not the key point here. The point, rather, is that a serious start had been made to articulate school practices with “mature” versions of practices beyond school, and that there is potential to be built on further. Victor had addressed the issues identified here and taken a stand on them.

In this respect, subjects like Agri-Technology may actually have greater potential to engage learners in real life and life like literacy activities than subject English—which may at first sight seem to have the inside running in language and literacy education. KLA Technology can articulate directly to a diverse range of institutional contexts where authentic language and literacy forms get played out. In addition, there are implications here for language across the curriculum. For many of the goals of English syllabus statements to be met—insofar as these extend beyond preparing students for future lives as language teachers, poets, literary critics, and the like—it is important that curriculum planning for language and literacy education explore, develop, and make explicit the pedagogical and programmatic links between subject English and other curriculum areas. Elmwood provides interesting clues in this regard.

Third, there was much potential for developing the cultural and critical dimensions of literacy in what we saw at Elmwood as a consequence of literacy activity being grounded to the extent it was in real life and life like practices. The various literacy tasks could readily be addressed as intrinsic components of technology as cultural practice. Students were able to see how text-mediated processes of gathering information, evaluation, comparing options, weighing costs and benefits, and so on are intrinsic to operating “technologically” in the terms defined by KLA Technology. At the same time, ample scope exists for critical engagement in projects like the Garden Project. This is partly internal critique: as when language and literacy are engaged in challenging or defending one option in relation to others. Beyond this, however, there is considerable scope for exposing the particular literacies employed in the Garden Project themselves to critique: why *these* (“spec analysis”, “CAF”) and not *others* (e.g., interviewing neighbours about what they have done, and why; researching garden types from all over the world and choosing one that looks intriguing)? More

ambitiously, the very worldview presupposed in “being technological” according to the KLA Technology conception could be opened up for analysis and critique as a cross curriculum theme—bearing in mind that KLA Technology is not simply a curriculum subject, but also an initiation into a way of being: of helping to construct who and what we become as people.

Fourth, Elmwood provides a valuable corrective to our largely *commodified* notions of technology as electronic gadgets and whizzbangery which (magically) provide solutions to problems—including *educational* problems—and allegedly hold the key to social progress. This kind of thinking suits producers and distributors of high technology products, and it often proves expeditious for policymakers and politicians. For example, in his 1996 State of the Union address, President Clinton spelled out strategies for ensuring that “all Americans have the best education in the world”. Connecting all students of 12 years and above to the Internet by the end of the century was identified as a key strategic plank in the government’s policy approach. This provision would, allegedly, ensure that by the year 2000, “children in the most isolated towns, the most comfortable suburbs, the poorest inner-city schools will have the same access to the same universe of knowledge”.

At this time, Australian schools are under almost unassailable pressure to join the hi tech race and, in doing so, to risk becoming caught in mystified thinking about what tools can and cannot do. Tools, on their own, *cannot* design, make and appraise. They can, however, be very powerful and effective adjuncts to designing, making and appraising, in the hands of competent technology practitioners.

Susie’s insight—“I first thought technology was about computers, but when I was introduced to [Technology] in textiles I saw that I could make a project a better thing by designing, making and appraising”—redresses an important balance. It is also potentially an *empowering* (in a non-trivial sense of the term) insight, when seen alongside such observations as the following, advanced with such prescience almost 25 years ago by Ivan Illich (1973).

“Once basic needs have been translated by a society into demands for scientifically produced commodities, poverty is defined by standards which the technocrats can change at will. Poverty then refers to those who have fallen behind an advertised ideal of consumption in some important aspect.” (Illich, 1973, p.11)

Finally, the snapshot of Steven highlights a host of issues about literacies and their embeddedness in social practices and provides a timely reminder of the costs associated with language and literacy education in classrooms when activities become separated from “mature” versions of social practices and lose touch with life trajectories. In Steven’s case, the presentation dimension of the Garden Project became abstracted from the real life purpose of the project and—if we acknowledge Steven’s aspirations to be a farmer—*his* projection of a life trajectory. The point of the presentation was to render information to other people and to communicate steps he went through and how he went through them in the course of his project. From this standpoint, Victor’s notion of how preparing and executing the oral presentation could

be done seem close to the mark. Indeed, when we think of many mainstream presentations, top performers do not operate chained to their scripts. They tell it as they see it, often making use of minimal notes. Often their props will be prepared by other people. In Steven's case, support was provided by a *specialist* language teacher, who was not connected to the Garden Project and who was operating from more or less technical notions of language which became imposed on the immediate practice—a project-based oral presentation—in counter-productive ways.

The Garden Project, like much of professional, civic, and productive life, was not first and foremost focused on *literacy*. It was about identifying viable things to do, identifying and organising priorities, maximising outcomes from inputs, and planning and executing the project in accordance with the design, make, and appraise logic of KLA Technology. Here, as elsewhere, the literacy components were not ends in themselves. They comprise a medium for getting things done. Clearly, difficulties with operating printed texts *can and often does* circumscribe the information base from which options are framed, decisions made, and problems addressed. At the same time, however, much of this can be done orally, graphically/visually, and through accessing other people's experience. At the end of the project, Steven demonstrated that he had acquired the main learning aspects of the Garden Project as a technological engagement. But his presentation was a disaster, and had a counterproductive effect—which could have been avoided.

The implication in such cases is *not* to go soft on literacy. Rather, it is to ensure that literacy is *appropriate* to the practice and the context—including the human context. In cases like the Garden Project (and the myriad other practices that would emerge in school settings if classroom learning were organised around the principles of “trajectories” and relatedness to “mature” versions of social practices), the point is to conceive the literacy requirements in terms of the larger social practice involved, and to tailor literacy activity accordingly.

## FACING THE CHALLENGE IN A REMOTE RURAL REGION

### **1. *The study at a glance***

This study investigates three geographically remote sites—two primary classrooms and one Year 9/10 setting—within a single administrative region. The sites form a loose “cluster” in that they are served by the same Learning Technology Education Adviser (EA), who was working with students and teachers using Hypercard, CD ROMs, email, video, digital cameras, and word processing/publishing software. Our account focuses particularly on how participants in the sites 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.

In the activities we observed, 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 9 and 10 students worked with the Business Studies teacher and the EA to produce a Hypercard prop for the Principal’s end of year speech.

Positive aspects of the practices variously included 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 what we have referred to as “fragility”, in terms of equipment and human resources alike; questions 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.

### **2. *The site***

At the time of this study the state education department had divided the state into a number of administrative regions. Each region was served by: a regional head office, a number of school support centres, usually located in larger towns, and a number of sub-school support centres, typically located in smaller towns. Generally, administrative staff were located at the regional head office, while support personnel whose jobs included contacting schools on a regular basis, were based at the various support centres (school and sub-school support centres).



This study involves three schools, located in the same region, and served by the same sub-school support centre. Tipping, Manjerra, and Danton, are quite distant from each other; Tipping and Danton are 340kms apart. Despite the distance separating them, the three schools share three features in common. The first is the presence of an innovative, enthusiastic, educational adviser based at the sub-school support centre. Her role is to assist and advise schools in their use of Learning Technologies. Second, since each school is within the state system, common contextual parameters and guidelines were provided by the state English syllabus, the departmental "Computers in Use" policy, and the state funding allocations for provision of computers in schools. The third commonality is provided by Commonwealth funding programs for schools. The three schools were all entitled to such funding from two different programs: a program to assist schools in isolated and rural communities, and a program to assist schools in low socio economic communities.

The three schools are located in a rural area several hundred kilometres from the state capital. It is predominantly a wheat growing area, although cattle and sheep grazing, cotton, and other grain production also fall within the area's agricultural concerns. During the 1990s, the area has been dramatically affected by drought, as well as global economic factors such as changes to export prices and demand for beef, wheat and wool. The three schools are located in small towns. Shopping, banking, and government services are provided in two large towns, each at least an hour's drive from each of the schools.

At the time of our visit, Tipping was enjoying an economic upturn. The drought had broken in time for a "bumper" wheat crop. This was being harvested during our visit. The local newspaper referred to record prices and crops, trucks loading grain from the silo lined the streets bordering onto the school and roared up and down the narrow road connecting Tipping to the next major town. Members of the school staff worked at night to assist in the harvest, driving harvesters, cooking meals for workers, preparing lunches for the following day. The town consists of the primary school, a hotel, a general store, and a railway siding. Most families sent children to boarding school for secondary schooling, a few using a high school at a town about 40kms away. At the time of our study, there were 53 students attending Tipping school. The school was organised into three classes: a Preschool/1/2 class; a 3/4 class; and a 5/6/7 class. There were 18 students in the 5/6/7 class which is the focus of our study.

Manjerra is a small town separated by the railway line and crossing from the nearby major highway. On the highway itself there is a service station and hotel. Across the railway line, in the "town proper" are the school, a garage, and police station. Manjerra is 85kms from one of the major towns servicing the region. At another small town, 44kms away, is a secondary school. Some parents choose to send children to boarding school for their secondary education. Manjerra is a close knit town. The hotel provides a site for social gatherings and community meetings. At the time of our visit 46 students were attending Manjerra school. There were 26 P-4 students, and 20 students in Years 5/6/7. The latter group provides the focus of our study.

The remaining small town, Danton, is on a road leading to a large national park. It is 90kms from the nearest large town, and the nature of the road affects the time taken

to travel this distance. The town has a hotel, the school, a motel, general store, service station, newsagent, stock agent, and some other small businesses that take advantage of the passing tourist traffic. Danton school is a combined primary and secondary school: that is, there are 100 students in the P-7 primary section, and 20 students in the secondary department of Years 8-10. Students can attend Danton until Year 10 and then move to boarding school, or else attend Danton until the end of their primary education in Year 7 and then move to boarding school. The number of students who choose the former option can alter dramatically from year to year. Economic factors influence this choice, and we were informed that in recent years more and more students are choosing to remain at Danton until the end of Year 10. The group of students at the centre of our study were Year 9/10 Business Studies students, working on a project at lunchtimes, in other study breaks, and in lessons with the Business Studies teacher.

There are many common features of the physical appearance and emotional atmosphere of the three schools. All three schools are set in well landscaped gardens, that, despite a prolonged drought, appear as green oases in the dusty towns. The two primary schools, Tipping and Manjerra, are almost identical in the appearance and number of buildings, and the layout of the classrooms. Danton is slightly larger, with the secondary department occupying a building separate from the primary school. All buildings are typical of those built by the government for education purposes: i.e., high set, wide verandahs across the length, concreted shady playing areas underneath. A quiet, studious atmosphere permeated the three schools. Visitors from cities, and from large suburban schools are struck by the silence, by the impeccable manners of the students, by the scarcity of "behaviour problems", unruly students and stressed teachers. Each classroom we visited was characterised by cooperative learning situations, organised students who appeared to remain "on task" despite our visible presence, and teachers who worked with small groups in a facilitative role rather than in whole class direct teaching modes.

At Tipping and Manjerra, the classrooms appeared spacious and well set out. Tipping's Year 5/6/7 class was located in a room separated from other classrooms by the staffroom and administrative office. The room itself was large, with desks facing the large blackboard on one side of the room, and clusters of worktables, bookshelves, and a computer desk at the other end of the room. As well, the room led onto an enclosed verandah, that housed more bookshelves and computer desks. On the other side of the classroom, doors led to another smaller enclosed verandah, filled with bean bags and book displays. This had a small room attached to it. This room housed a computer with modem and telephone line which had been installed for use by students learning a second language. Commercial posters, teacher-drawn charts, and students' art work festooned every square inch of wall space.

Manjerra's Year 5/6/7 class also inhabited a large classroom. The enclosed verandah formed part of the classroom, and contained long wooden tables used in Art classes. The room itself contained groups of desks close to the long blackboard. A bank of computers lined the back wall. Close to the blackboard were another two computers, one with modem access, the other equipped with a CD-ROM drive. Ropes strung across walls and doorways carried samples of students' writing, and art work. Posters and charts filled all available wall space.

Danton's secondary department included a Business Studies Centre. This classroom contained a blackboard, and tables arranged in two horseshoe formations. These tables held a mixture of electric typewriters, computers, and printers. Electric leads criss-crossed the room, some vertically connected to powerpoints installed in overhead beams, others connected to each other and wall sockets by powerboards and double adaptors. The room was filled with charts, commercially and teacher produced, containing guides and directions to computer software and financial accounting methods.

### **3. The policy context**

#### *(a) English*

The *Queensland English Syllabus for Years 1 to 10* provides a common link between the three classes in this site study. This syllabus makes explicit references to the nature and role of new technologies within the social practices and discourses of contemporary life, to which Subject English must respond and be accountable (DEQ, 1994a, pp. 19, 31, 34, 46, 48). Furthermore, by dint of its solid grounding in "genre theory", the Syllabus communicates a strong implicit recognition of how new technologies are integral to a wide range of powerful language uses, purposes, and texts. Nonetheless, the Queensland Syllabus cannot be said to foreground or even to reflect the extent to which new technologies permeate daily life. The syllabus as a whole is strongly dominated by literary and grammar overtones that maintain an emphasis on conventional print texts and on "media texts" (read film, print and TV advertisements) over digitally coded texts. The Queensland English Syllabus is based on ideas that are, in principle, conducive to developing symbolic-analytic competence. One guiding motif is that if learners are to become powerful language users and controllers of powerful genres, they must develop a meta-level awareness of language: e.g., they need to know genres for what they are, and to master those genres which underlie effective participation in everyday life. Teachers are exhorted to make the purposes, generic structures, linguistic features, and cultural contexts of text production and functions explicit (cf, DEQ, 1994a, especially pp. 2, 6, 11, 27-36).

The development of School English Programs was a major focus of the implementation of the Queensland English Syllabus in schools. Guidelines for developing these programs are provided in the DEQ, 1994a, pp. 37-40) and educational advisers were appointed by the department to explicitly assist schools with writing their programs. A moderation process was undertaken, whereby schools lodged their programs with regional offices, and the programs were checked and evaluated by a team including educational advisers, departmental officers, principals and teachers. Essentially, School English Programs resemble each other, across the state, and across regions; section headings are identical, aims and objectives similarly worded, some sections have been lifted verbatim from the syllabus documents, references to the syllabus documents litter the pages. In reality, the program provides the base for day to day teaching and learning, and allows teachers

to utilise their skills and talents (See also Abbotsdale and BushNet site studies, this volume).

*(b) Computers*

Manjerra's Computer Policy reflects the departmental *Computers in Learning Policy* and the *Guidelines for the Use of Computers in Learning* (DEQ, 1995a & 1995b) in the same way that the School English Program reflects the departmental syllabus. Danton's Computer Education Policy was developed before the departmental documents were published, and so does not follow the same format. Both Danton and Tipping were in the process of updating and rewriting their computer policies, presumably to follow these departmental guidelines. Danton also relied heavily on *Years 4 to 8 Keyboarding Curriculum Guide with Annotated Selection*, and had incorporated this guide into their School English Program.

*(c) Resources*

A significant factor in the use of computers in these classroom was the quantity and quality of resources available. The Education Department began an organised approach to computer allocation and purchasing in the 1990s through the Year 6/7 Computer Policy. This program allocated computers to each school according to the number of students in first Year 7 and then Year 6. No money was, or has subsequently been, allocated for the maintenance of equipment purchased through this program.

Each school makes purchasing decisions of their own, with little direction from the department. Parent associations often influence these decisions, mainly because the fundraising work of such associations, pays for the "extras" such as computers. For example, at Manjerra, a concerted effort by the parent association had resulted in a successful use of the Coles for Computers scheme, where shopping dockets were exchanged for computer equipment. This fundraising occurred on the basis of the priority set by the school.

The high turnover of staff in rural schools also influences purchasing and resourcing decisions. For example, at Tipping, a principal who has now left the school, decided to install the telephone line for modem access in the tiny room off the Year 5/6/7 classroom. Teresa would have made greater use of the modem access if it had been in a larger or more central area. Computer policies, procedures and guidelines were written and developed by staff who were subsequently replaced by other teachers. The teachers who followed felt different priorities were necessary.

All three schools received Commonwealth funding for socio economically and geographically disadvantaged schools. All three schools had used this funding to increase their technological resources. However, funding through these schemes requires preparation of submissions that adhere to priorities established by the Commonwealth government. For example, at the time of our study, both Danton and Manjerra had recently received news that their submissions to one of these schemes

for extra technological equipment had been rejected, on the grounds that the submissions did not meet priority criteria.

Isolation was a major factor in the quality of resources available to each school. At Tipping, the ISP was unreliable and expensive, and the standard of phone equipment and lines was outdated. Computer equipment needing repair had to be sent to a major city over 600kms away and technical advice could be obtained from the school support centre over 500kms away. Teresa therefore, was wary of “fiddling” with the computers in the school herself. A recent crash of a hard drive had resulted in the loss of the computer for the whole school term. Teresa was also reluctant to allow students access to the computers unsupervised; an experience where students had trashed files and changed features of the hard drive had caused her to keep the computer modem room locked if she was not present.

The LOTE program used at Tipping provides an example of the rift between departmental attempts to overcome isolation barriers and the practical implementation of such attempts. The Electronic Classroom was established by the department to enable students in Year 6 and 7 to take part in the mandatory LOTE program. Equipment given to schools included the Macintosh LC475, modem, phone line, microphones and Conferlink phone housed in the tiny room off Teresa’s classroom. Twice a week, Year 6 and Year 7 students engaged in French lessons with students from four other isolated schools, and a French teacher based in a large town in the region. The students are supposed to sit in front of the computer, download graphics from the machine which are fed in by the teacher who is talking to them on the telephone. Difficulties encountered include: poor telephone connections causing phone calls to be cut off; the small 4Meg Ram on the computer causing computer “freezing”; an incongruence between visual and audio reception which results in instructions from teacher being irrelevant or insufficient; poor visual reception causing students to miss important sections of the lesson; and poor audio connection which means students often cannot hear other students or the teacher. Support for the Electronic Classroom is minimal. Any failed equipment is sent away, advice is obtained via lengthy, expensive STD phone calls, and a request for an upgrade of the computer’s Ram size was refused.

#### **4. The practice**

##### *(a) Human participants*

The “human connector” of these three classrooms was Georgia, an educational adviser on learning technologies employed by the state education department and based at the sub-school support centre serving that part of the larger region. Although the department’s corporate plan identifies Learning Technologies as a priority area, each departmental region is served by a single educational adviser. So while the sub-support centre at which Georgia was based only served a third of the entire region, Georgia herself was responsible for effective use of learning technologies across the region as a whole. She was responsible for schools up to

300kms away from her base. Hence, many schools received only infrequent visits, and requests for urgent assistance often could not be met for weeks.

Despite this geographical factor, and the extreme demands placed on her, Georgia's energy, commitment and innovative capacity undergird the activities described in this study. At the time of the study, Georgia was trialling the use of an Apple QuickTake camera and scanner, in the context of classroom activities aimed at producing Hypercard presentations. Georgia also took on responsibility for transferring each of the completed Hypercard presentations onto a CD-ROM. Some schools had purchased their own QuickTake cameras, and the QuickTake camera was part of future projects for Manjerra. The scanner used in the activities we observed was owned by the sub-school support centre, and was carried from school to school by Georgia on her visits.

As well as providing this and other equipment, Georgia 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 our visit 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 clearly worried about the impact on their teaching and learning processes for the future. They all spoke of Georgia's commitment, after hours work, and professional dedication, and expressed concerns to do with furthering their technological expertise. One teacher commented that "as a teacher I believe I should be accessing further professional development outside of school, to keep my skills up to scratch, and don't believe I should be totally reliant on Georgia".

Teresa, the teacher at Tipping, was posted to the school ten years previously. She has remained at the school because of her marriage to a local. Teresa majored in computing studies during her preservice teacher education, and has been the Computing Coordinator for the school since her arrival. Although her studies proved virtually useless in classroom applications, (programming using BASIC, some LOGO projects), they did ignite her interest in computers.

Mary, the teacher at Manjerra, is also the Principal of the school. She has only recently returned to full time teaching, after some years at home caring for her children. At the time of our visit, Mary was in her first year at Manjerra. She had returned to full time teaching via a stint as a casual relief teacher for the region, followed by permanent appointment by way of the application and merit system. Mary is enthusiastic about her new position, and has made great inroads into substantial changes and reworkings of school policies and procedures. During our visit, Mary discussed with us her decision to begin a Graduate Diploma of Computer Education in 1997.

Like Mary, the teacher at Danton, Denise had also only recently returned to full time teaching after some years at home caring for children. As a Business Studies

teacher, Denise felt the impact of new technologies more deeply than other secondary teachers. When she began teaching, manual typewriters were used to teach (mainly) girls typing skills. On her return Denise found that computers had already taken the place of electric typewriters, and the typing skills component of the Business Studies syllabus had been replaced with Keyboarding skills.

The students at all three schools either came from outlying properties or lived in the town. Students often travelled great distances to come to school, an hour's bus trip in the morning and again in the afternoon was not unusual. Those who lived on outlying properties seemed to be those most familiar with computers. Many families had purchased computers for use in the family business. For example, Mary and her husband used the family computer to keep track of cattle breeding programs on their property. Students told us their families had purchased computers for educational use, but then had made use of the equipment to assist with such property management practices.

Many of the students, from town or properties, did not have access to television. At Tipping, the school owned a satellite dish, and until recently, this was the only place in the town that could receive any television service. The introduction of pay television via satellite services had altered this situation in the previous twelve months, and a number of families had connected to the service.

(b) *Non-human resources.*

#### **Equipment shared by schools and supplied by sub-school support centre**

- QuickTake camera;
- scanner;
- Macintosh 630CD;
- cables connecting vcr to computer.

#### **Resources used by Tipping**

- Macintosh LC630- shared with Year 3/4 class;
- Macintosh LC475, modem, phone line, microphones and Conferlink phone— provided by department for LOTE lessons;
- external CD-ROM drive and HP Deskwriter 600 printer attached to above computer
- Apple 11E- 2 and 2 Image Writer 11 printers;
- related newspaper and magazine articles, videos and recorded TV programs, and educational products released to coincide with Olympic Games;
- a range of software including Hypercard, Clarisworks, skill and drill games;
- teacher constructed and commercially produced worksheets.

#### **Resources used by Manjerra:**

- Macintosh Classic- 5 computers purchased through Coles for Computers scheme;
- CPU computer provided by department for professional development and housed in the library;

- Macintosh LC630CD;
- modem and phone line;
- Deskwriter 600 printer;
- dot matrix printers attached to Mac Classics;
- television and VCR;
- a range of software including Clarisworks, Hypercard, KidPix Studio, CD-ROMs (encyclopaedias, factual texts), Internet connection and email software;
- print based texts including encyclopaedias, factual texts, from school library;
- teacher constructed and commercially produced worksheets.

**Resources used by Danton:**

- Macintosh Performa - 4 computers;
- Macintosh Classics - 3 computers;
- Pentium CPU computer- won by student in Art competition;
- Apple printer;
- Olympic electric typewriters;
- a range of software including Clarisworks, Hypercard;
- teacher constructed and commercially prepared wall charts.

*(c) Immediate learning context*

The main focus of this study is the use of Hypercard and associated media tools, like QuickTake camera, videos and scanners, by each of the three classes. The contextual factors surrounding the use of this software, however, differ for each class. In addition, other applications such as word processing, CD-ROMs and the Internet were also employed in the classrooms as part of the various projects.

Mary explained that as technology adviser Georgia's role in the project we observed at Manjerra was to teach the students the "technical skills", while her own role was to develop the activities within the project. This was done by mutual consultation between teacher and EA, with the teacher having responsibility for activity planning.

*(i) At Tipping.*

At Tipping, the class had produced a Hypercard presentation on Olympic Athletes during the school term preceding our visit. This unit of work coincided with the 1996 Summer Olympics. The presentation had been transferred to a CD-ROM by Georgia, and Teresa had only recently received this CD-ROM to view and share with students. The Tipping study, then, was a retrospective study where we were looking at a completed project and discussing with Teresa and her students their recollections of work already finished.

At the time of our visit, Teresa and her class were involved in a unit of work on Space, in which the Hypercard dimension from the previous term had given way to use of the Internet. Teresa was eager to use the Internet to search for useful sites, and share these sites with her students. As the modem connected computer was in the tiny room off the classroom, this sharing could only be done with five or six students at a



time. As well, Teresa had initiated a keypal project. At the time of our visit, students were in the process of constructing initial letters to their keypals using pen and paper. Teresa had also gained access to CD-ROMs with "Space" information, and had collected a set of resources from the school library on the topic. These resources were displayed around the room in various book shelves. Materials pertaining to this unit, and to the previous Olympic unit were displayed on wall space. These materials included a chart of Orientating, Enhancing, and Synthesising Activities planned for the Space unit, and a "genre structure" chart for biographies, as well as examples of students' work from both units. During our time in the classroom, we observed the students using the modem connected computer, and using the Apple11Es on the verandah for Maths "drill and skill" games (eg. Mathsblaster). The MacLC630 had been borrowed from the Year 3/4 class expressly for our visit, and was used by Teresa to show us the Olympic CD-ROM. During our visit, students were mainly occupied at their desks, completing blackboard exercises or those produced on teacher made or commercial worksheets.

*(ii) At Manjerra.*

The Hypercard presentation being prepared by Manjerra students was already in progress at the time of our visit. Mary had devised a unit of work on environmental themes. She had set up a keypals project using the Internet connection in the classroom. Students were divided into groups. Overseas email contacts had been made during a prior email activity. (Mary explained that "their genre focus that term was on invitations and letter writing for differing audiences. The focus in this particular project was on information gathering and the relative use of technology".) Each group communicated by email with the contact people previously located in the country they were studying as the focus for their unit of work. The part of the unit we observed them working on was developed around an environmental issue in the countries in question. This would then be presented in Hypercard format as one aspect of the larger unit of work. The generic structure of an information report was being used as the basis of the Hypercard presentation. In addition, the students used electronic texts on CD-ROM such as encyclopaedias (Encarta) and other references (e.g., Australian Endangered Species) to research the relevant countries and the particular environmental issue. The bank of Macintosh Classics were used constantly for word processing, and playing Maths "skill and drill" games. Students used clipart programs to add illustrations to word processed documents. While this "technology" work was occurring, students were also occupied with printbased texts, including library reference books, teacher and commercially produced worksheets (e.g., spelling lists and exercises, comprehension exercises), writing drafts in exercise books.

*(iii) At Danton.*

The "class" at Danton was not so much a class at all, but a group of students from Years 8-10 who were working on a Hypercard presentation to be used during their end of year speech night. While the project revolved around Business Studies, it was an extra curricular activity. The presentation was designed to be integrated into, and augment, the Principal's speech, by presenting images of the school year. These

images came from the QuickTake camera, video frames from videos filmed by the students, or conventional photographs scanned into the computer. The production process itself was broken into specific tasks, delegated to individuals or pairs of students who had undertaken responsibility for completing these tasks. At times Denise met with the team as a group, and in between they would report to her with photos, video takes, and other artefacts to be incorporated into the presentation. The work was nearing completion, and one of our visits coincided with the last visit by Georgia to the school before the speech night. Hence, there was a sense of urgency surrounding the completion of specific tasks.

Our visits to Danton included class time and lunch breaks. As the end of year was close, students were involved in evaluative assignments e.g., some students were observed taking their Typing tests. During class time, the Business Studies Centre seemed to be filled with individuals or pairs of students completing diverse tasks. These tasks included: typing tests, downloading images from the QuickTake camera, building links to slides in Hypercard, completing word processing assignments for Year 8 English class, creating invitation for speech night, completing a print based balance sheet for Business Principles, selecting photographs to be scanned by Georgia. The lunch break was indicated by a slight decrease in number of students in the room, and a changeover in students. Some students arrived, others departed, others kept on working on task. Denise remained in the room for the lunch break, and still directed students on their tasks.

## **5. Distinctive features of the practice**

### *(a) Some pedagogical elements*

At Tipping and Manjerra, though less obviously at Danton, we observed a pedagogical approach that is common to multi-age classes, especially in small schools where there may be only 15-20 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 introduction of computers into classrooms that operate within this pedagogical style is quite successful in terms of integration and access. At Manjerra, for example, we observed students regularly moving from desks and printbased activities, to word processing on the Mac Classics, or taking their turn using the clipart program, the printer, or the CD-ROM. There were no rosters or time allocation discussions. There was not even a written list of students waiting their turns. Most importantly, there was

no acrimony or heated exchanges involved in the turnovers. Occasionally Mary would point out to a student that other students were waiting their turn, or that his/her time at the computer was not being used wisely.

One morning during our visit to Tipping, Teresa had organised an Internet session to access information about Planets. She had logged on the previous afternoon after school, had searched for relevant sites, and then used the Bookmark feature of Netscape to set up a planned search for the students. Because the Internet room was so small, she called on the Year 7s first to join her: "the others will get a turn". The group of 6 Year 7 students went into the room with Teresa, while the rest of the class continued on with their Maths activities. Unfortunately, the ISP connection could not be made. While Teresa continued to attempt to log on, the Year 7 students quietly returned to class, and continued on with their Maths activities. Our initial interview with Teresa was conducted during class time, down one end of the classroom, while her class worked peacefully and energetically on various activities.

*(b) Georgia's role*

As noted above, the educational adviser, Georgia, was the human factor linking these three classrooms and their common technological elements. While her relationship with each of the teachers was similar, the ways in which these teachers used her in their classrooms was different.

At Tipping, Teresa felt a need to "be confident in teaching the kids how to use different technologies". Usually, she would explore a new piece of software, introduce the program to the students, and then "let the kids go for it". In this classroom, Georgia trained the teacher in using the Quick Take camera, scanner, and Hypercard software. By the time of our visit the completed CD-ROM had just arrived at the school, providing an illustrative artefact of Teresa and Georgia's work. Teresa had, on many occasions, planned small group lessons to teach the students some of the skills associated with using these new technologies. However, most of these lessons were interrupted by technical problems. In Teresa's words, such interruptions "distorted their understanding of the process", and therefore some of the students we interviewed could not explain to us the structure of the presentation, the technical skills required to construct a presentation, or how to use the camera or scanner.

In contrast, at Manjerra, Georgia trained the students how to use the camera, Hypercard, and video frame transferring software, with little or no involvement on Mary's part. For example, we observed one small group of students working with Georgia, selecting video frames, and transferring them to the computer. Normally, Georgia trained Mary in the same applications, either during lunch breaks or after school. This did not occur on the occasion we observed because Mary spent her time with the researchers. Mary's strategy was to have Georgia teach a particular application to a small group of students. Other applications would be taught to other small groups. These various groups would then become the teachers of what they knew respectively to other groups. Mary saw this procedure "as a positive, in that the students see that as an adult you never stop learning and that part of the classroom is

about sharing and co-operation". Furthermore, "children understand concepts better if they have to explain the "workings" to someone else".

At Danton, Denise and her student cohort often joined together to learn skills from Georgia. When Georgia was engaged with students in completing a task, such as downloading images from the QuickTake camera to the computer, Denise hovered nearby, asking questions and taking part in the "lesson". On some occasions, however, Georgia was used as a technician to complete certain processes, rather than as a teacher. On one occasion we observed Georgia scanning images from conventional cameras into the computer, on her own, at lunchtime. This assignment of tasks was due to the limited time available to complete the project.

*(c) Literacy and technologies: selected themes.*

*(i) At Tipping*

We asked Teresa what new literacies she envisaged existing in the future. Her answer reinforced our observations of her use of computers in the classroom. We will be "using old skills but applying them in a new way". During our discussion of the Hypercard activity Teresa frequently referred to literacy skills and understandings involved in researching and reporting biographical information. The emphasis on research skills was illuminated by Teresa's comments on the ways in which reading and writing change when new technologies are introduced. Teresa made the following points, (taken verbatim from recorded interviews):

- they have to search, research, scan, so much information, have to be more "picky";
- kids who have trouble reading have trouble with AAP information;
- they have to read, decide what's relevant;
- need to read critically not just be consumers;
- skills used in research for hypercard project were the same, set up the same way using pencil and paper, but a different presentation;
- skills used were notetaking, scanning, and collecting information.

The focus of the activity for the students at Tipping in their Hypercard presentation was the research they undertook to gather and organise information for presenting biographies of Olympic athletes. Some key features of the English Syllabus were overtly on display in the classroom, in the form of a chart on the Orientating, Enhancing and Synthesising Activities pinned on the wall of the classroom. On another wall was a chart outlining the generic structure the students should follow in their biography construction: the headings included Name, Date of Birth, Event, Background, etc. This was an instance of students using new technologies to engage in long established classroom literacy activities which in the past employed "old" technologies: cardboard and felt tip pens, magazines, scissors and paste.

*(ii) At Manjerra*

While the use of computers and associated technologies at Manjerra was integrated almost seamlessly into classroom practices, the overt focus at the time of our

observations was on developing technological skills, rather than literacy practices which incorporated the new technologies. At the same time, as Mary reminded us, it is important to recognise that “all learning is underpinned by language and literacy—children need the opportunities to work with images, sound, and texts separately, as well as within multi-modal concepts”.

Mary often mentioned her reliance on incidental learning and teaching, closely related to the *focused learning episodes* described in the English syllabus. Teaching was done “on the run”, when and where students needed to learn something specific to continue working on projects. A structured format had been developed in the original stages of the project. What appeared on the surface as “teaching on the run” in fact exemplified the process of catering for individual differences and learning styles. In Mary’s words, “what appears on the surface does not always account for the underlying structure. What may appear as superficial chaos belies the true indicator, in that learning goes on”. Mary noted the importance of teachers working in accordance with students learning styles, and making adjustments accordingly. “No teacher is going to refuse helping students with their learning styles [simply] because it is not the next topic in their planned program. Multi age/level classrooms are all about incidental teaching and learning, based on a focused learning topic and catering to the individual’s needs”. Examples of these learning episodes we observed include: Mary guiding three students in their use of the overhead projector to enlarge images for tracing; a student receiving individual reading instruction for five minutes from Mary; Georgia showing a group of students how to capture a video image from a VCR and transfer it to the computer; a student demonstrating to another two students how to copy clipart images into word processing documents; Mary explaining to students how to complete a reading comprehension worksheet.

The following snapshot provides a good example of the pedagogical process of meeting individual needs. It reflects Mary’s philosophy of what “primary education is about—and [students] don’t get to do it anywhere else”.

#### *Snapshot 1*

Down the back of the classroom three students sit at the Mac Classics. One is constructing a narrative, one is using the spellchecker to edit her information report on The Hairy Nosed Wombat, the third is updating his draft information report by keying in alterations suggested by Mary. At the front of the room, two students are using a CD-ROM to locate information about endangered animals. Because there is no cable to link the computer to a nearby printer, they cannot print out the required pages. So one is reading off the screen, converting the information orally into notes, and dictating these notes to her partner. The computer next to them is being used by two students who are inserting images copied from a clipart program into documents that contain their “final draft” narratives. A group of students sit in desks nearby, waiting their turn and passing the time by browsing through the guidebook to the clipart program, and discussing the selection of images to illustrate their final drafts. Another group of desks is occupied by students who are copying their daily spelling words from the blackboard, and constructing sentences that use these words. And over there are the group of students reading print based information texts from the library.

The Manjerra students took the use of new technologies for granted. Many of those we spoke to 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 and the students saw a hierarchy of values among sources of information. Within this context some intriguing differences emerged between the ways different actors in the classroom viewed and approached information. Mary told us she 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 via websites or through email exchanges. The following fragment from conversation with a student reveals the process in operation. It had been pointed out that the books are there but are not always the most up to date sources of information. The learners make their choice, opting for the computer where they believe it offers the most up to date information.

**Interviewer:** Have you used books to help write this report?

**Student:** No

**Interviewer:** Is there any information in books on this topic?

**Student:** Yes

**Interviewer:** Why not use them then?

**Student:** There’s enough information in Encarta.

**Interviewer:** Is the information better?

**Student:** It’s more up to date.

**Interviewer:** What are the other advantages of using Encarta?

**Student:** You can print it out, you don’t have to go looking for the book. Books are better if Encarta hasn’t got the animal in it, you can look in books then.

**Interviewer:** What do you use email for?

**Student:** We write backwards and forwards. We get information from them and they get it from us. Like how big Australia is and how big Sweden is.

**Interviewer:** What's the difference between doing that and going to an encyclopaedia?

**Student:** If you get onto the Internet its got up to date information.

The use of email as an information source is neatly explained in the following "snapshot", where an information report was part of the generic structure of the environment project. In subsequent projects email could be used in a different way within a different context.

### *Snapshot 2*

Amy is 11 and is in Year 6. She has been selected by her teacher to be one of six students to speak to me individually. She is characterised by her teacher as an above average student who has little trouble with academic work. She seems to work confidently in the classroom as I observe her before our interview. She helps another student transfer work from a Macintosh to the IBM, import a graphic from a clipart program, and then print the final draft. She uses the spellchecker feature on Clarisworks to check her own draft while I am speaking to her. I was first struck by her casual approach to the new technology. She had been using computers for years, since preschool they had been an integral part of the classroom. Tasks involved playing games and word processing, more specifically, publishing using a word processing program. When asked what literacy practices she engaged in, or What kind of reading and writing do you do in class?, Amy responded with: "silent reading, partner reading, spelling sentences in the morning, poetry". When I asked Amy about the keypals project her class was involved in she was less than enthusiastic. The advantages of using email over postal mail, that is it is quicker and more reliable, were outweighed by the impersonality of the email system. She did not mention the names of her keypals, but rather referred to them by their country of origin, e.g. "we haven't got a reply yet from Antarctica but we got one from Sweden, oh and one from Florida". Amy uses email "to write and ask for information". Amy corresponds regularly with a friend who is now at boarding school. I asked her if she would continue this correspondence using email if it was available. Amy replied "No, I ask questions on email, but I write to Karen about what's happening."

### *(iii) At Danton*

At Danton, Denise believed it was crucial for students to have opportunities to experience current technologies. Denise often referred in interviews to the community's geographic and social isolation from "mainstream Australia", expressing concern that the community may be isolated from ideas, and that important changes and opportunities in the cities are simply passing them by. She saw activities with digital cameras, multimedia authoring software, scanners and the like, as a way of providing students with experiences enjoyed by students in the "mainstream" (cities). Hence, she was quick to take advantage of the speech night occasion as a pretext for organising the group of students around the project, and to make use of the Georgia's availability and expertise, and of equipment not available at school.

Seeing HyperCard stacks as “stuff of the urban present”—a common tool in business circles, and increasingly popular in school settings—Denise threw herself into organising, teaching, and learning with these students, with Georgia’s input, to create an effective HyperCard presentation for a specific purpose within the larger life of the school.

A lunch-time work session began with Denise reminding the group that *‘We’re all in this together, otherwise it won’t work’*. The students had been quite enthusiastic about the project at first, but interest began to wane under competition from end of year distractions ranging from tests to anticipation of the long vacation. Time and equipment constraints were urgent. The group had only two days to access the scanner, the computer, and Georgia. Denise recapped the last group meeting, prompting them for the basic configuration of stacks she had suggested the previous week; that is, three stacks of unlimited “cards” or slides built around the outline the principal had written for her intended speech. Denise suggested using only three different backgrounds for the presentation—one for each stack—and allocated the task of snapping a digital shot of the school garden and administration block for the first stack to a lad sitting near her.

Denise talked about the audience for the presentation—parents and visitors—and emphasised that the students were actually working for the principal in preparing the presentation. Pairs and sub-groups within this group had earlier been given specific tasks to do, such as using the digital camera to photograph tuckshop staff and specialist teachers (e.g., physical education, music, etc.), grabbing image stills from video and converting them to digital images, interviewing staff and students, or using text art software to create headings and the like. Denise spent the remainder of the lunchtime session checking the progress of each task and working with the two students charged with setting up the “cards” on the computer. Because time was short, she simply showed and told the different students how to use the equipment, and explained as economically as possible the steps needed to complete their respective tasks.

## **6. Issues and Implications**

The three classrooms in this remote rural region were facing the challenge under extraordinarily difficult conditions. In part these difficulties were matters of availability of physical resources and technological support. In addition, however, they were matters of knowledge, understanding, and experience with respect to integrating new technologies into pedagogy in appropriate ways.

These difficulties notwithstanding, a number of positive features were apparent. In the first place, there was abundant evidence of dedicated and enthusiastic professionals working at and beyond the limits of their expertise to provide students with experiences of using a range of new technologies in learning tasks. Faced with self-identified shortfalls in knowledge, one teacher told us she read widely about applications of information and communications technologies in classrooms, and a second was exploring options for further study in this area.

At Manjerra we found word processing being used at all stages of text production, rather than as a mere “add on”—as is often found—where computers are used as a



publishing tool for producing the final copy. Manjerra students were given the choice of using pen and paper or computers to draft, edit, revise, and publish their writing.

At Tipping, key features of the Queensland English syllabus were used explicitly to develop literacy practices within contexts employing new technologies to produce the Hypercard presentation. For example, the generic structure of a biography had been taught to students, and activities were organised according to the “orienting-enhancing-synthesising” structure recommended in the syllabus.

At Danton, the business studies teacher introduced students to a use of presentation software that resembles mainstream uses within authentic business and commercial contexts. To this extent, she transcended the all too common occurrence of sublimating new technologies to processes of merely “doing school”.

These sites provide rich instantiations of issues and implications surrounding use of new technologies in schools. Three aspects stand out in particular.

First, the sites reflect what we refer to as “fragility”, in terms of both the technologies and human resources. At Tipping, the Internet connection proved unreliable, whilst at Danton the fact that some specialised equipment was available only on occasions put pressure on work schedules and restricted student opportunities to use and experiment with it—as they worked against the clock to be ready for speech night. With respect to human resources, heavy dependence of all three teachers on Georgia’s expertise in these early phases of learning to integrate new technologies into school-based learning does not imply a permanent condition, or that long term planning and development is jeopardised by experts (like the EA in this study) moving on. As one teacher put it, “teachers are multi-skilled; we are resilient, used to change and adapting—I could not as a professional allow the development of technology to go backwards, just because the EA has left. If this was the case nothing would happen in the classroom—you make a professional decision to get technology up and running as part of your daily program and learn together”. The expressed commitment here is evident. When the EA moves on, the program will respond accordingly, and build on the opportunities available in the new circumstances.

At the same time, it is important—and, in fact, necessary—to ensure that teachers at the chalkface are given as much systemic support and encouragement as possible. If we stress “fragility” here, it must be recognised that fragility is *not* the same as “frailty”. These teachers were in no way frail! Rather, the implications of fragility here include the importance of observing the principles of “workability” and “teachers first” described in volume one of this report. The former involves addressing whether and how a new technology improves the working conditions for students and/or teachers. This work must be a priority in deciding whether or not to adopt and implement a given tool. In this respect, as evinced in the three sites currently under discussion, expenditure on hardware and software is always 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. The principle of “teachers first” asserts the importance of attending adequately to the personal and professional needs of teachers as the first priority—even before the needs of learners. Teachers in these schools would have been well served by being supported to make use of new technologies to enhance their own work before taking them up in their classrooms.

Second, the use of new technologies to gather information in the specific project sessions we observed highlight the importance of “complementarity”: with respect to engaging explicitly the *cultural* dimension of computer-mediated literacy practices, and with a view to developing skills for *assessing* or *evaluating* as well as gathering information. The small sample of episodes we observed did not engage students in exploring the cultural meanings of computer-mediated literacy practices—although in at least one case this could not reasonably have been expected, given the extra curricular nature of the project. Nor did the activities we observed emphasise the importance of students adopting critical stances toward information or, more generally, toward the uses of new technologies within everyday social practices.

In the present cases, this undoubtedly had a lot to do with the fact that students and teachers alike were actively learning new applications. 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. On the other hand, 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—for whatever reasons. This is understandable in many of the cases we observed across the whole study, and within this remote rural region specifically, given the relatively limited prior experience many teachers have had with communications and information technologies. It does, however, reinforce the importance of attending to key principles like “teacher first”, “fragility”, “complementarity” and “continuity” within future policy directions and professional development and teacher education initiatives.

These observations are related to a third issue: namely, that participation within activities was sometimes fragmented. At Tipping, this was evident in the gaps in the students’ knowledge about the CD-ROM that had been produced. At Danton, the students had not been involved in framing the generic template for the speech night Hypercard presentation. Tasks were subsequently delegated to individuals and small groups somewhat like process line assembly. While students were being provided with opportunities they might not otherwise have had to learn operational aspects of various technologies and applications (e.g., using digital cameras, saving video grabs and inserting them into relevant sections of the presentation), they were not being initiated into practices of producing presentations as a whole. For this to have occurred, it would have been necessary for them to have encountered the production of Hypercard presentations under more expansive conditions.

It is very important to get these remarks in perspective and in context. In no way are we criticising *performance* here. That is not the purpose of either specific site studies or the project as a whole. The point is to describe practice as we saw it—and our observations in all cases were highly truncated and partial—and to use these descriptions to illustrate significant points. This is not the same thing as assigning an essence to what we observed, and it is certainly not to imply that what we did not see in particular instances did not go on elsewhere. It is simply to use snapshots for illustrative purposes that can be linked to larger principles and themes intended to enhance future practice on a larger scale.

Hence, while it is obvious that in some of the cases we observed here the point of the immediate or overall activity was *not* about language and literacy education per se, this does not mean that language and literacy is not involved, or that (incidental) learning does not occur that impacts on future literacy practices and performances. Literacy learning is not the preserve of particular classrooms or timetable slots. Indeed, so far as schools are concerned, it is not even the preserve of formal curriculum spaces. Learning experiences which are relevant to how we come to understand language use in relation to wider social practice—that is, language and literacy as embedded social practices—goes on in every sub-site and facet of a school's routines.

Given this, how we come to understand technology-mediated practices, and how we integrate new technologies into literacy-mediated practices, will depend on *what* we encounter in the way of practice—*wherever and whenever* we encounter it. Whatever our intentions as teachers may be about “covering” each of the operational, cultural, and critical dimensions of literacy within our programs and relating them to each other as integral aspects of literacy, it is how literacy practices are *experienced* by learners that really matters. Similarly, the fact that a social practice involving new technologies is experienced by learners under very difficult and challenging conditions does not obviate the fact that *what* is experienced (under these conditions) will have a very important impact on what that social practice is seen to comprise—and, hence, what “it” is learned as.

This speaks powerfully to the “workability” principle. It also requires that we ask tough questions. At what point does the value and benefit of “offering students opportunities to work with new technology applications” become outweighed by the risks of apprenticing them to less than optimal versions of social practice. The fact that a generation of young people were once obliged to apprentice themselves to love-making in the back seats of cars, we have often been told, did not exactly contribute to good practice. To extend the metaphor, we might well ask whether “shotgun marriages” of new technologies and classroom (literacy) pedagogy should be expected to produce happy and enduring working partnerships.

## **IN SPLENDID ISOLATION: CALDWELL PRIMARY SCHOOL**

### **1. The study at a glance**

At Caldwell Primary School (CPS), 25 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 in the McCormick (1995) sense, there is real enthusiasm for learning activities in this school, and a strong sense of what schooling means for the students' futures.

The small number of students allows the teachers freedom to work one-on-one with children who need blocks of attention, but the majority of their time is spent as facilitator, friend and guide. There is a noticeable warmth in the way students talk about their teachers while the teachers are enthusiastic about the capabilities of each one of their students. Consequently, the following is much more a snapshot of a family setting than an institutional one.

### **2. The site**

CPS is a K-6 school servicing a small agricultural community situated some 70 kms north-east of Wilson. The area has a population of approximately 200 scattered within a radius of 30 kms. The town started out as a railhead in 1932. It now services nearby farms whose principal incomes centre on cotton, wheat, barley, sorghum and cattle. The "town" consists of a golf club and a general store that serves take-away meals, fuel and a broad range of grocery items. An extension of the same building houses a large agricultural supplies store.

Caldwell Primary School was established in 1949. Over the years it has experienced the highs and lows of any agriculturally dependent community, and now numbers 25 students and 2 teaching staff. Although drought and a downturn in commodity prices have caused a departure of a number of workers and their families over the past few years, a promising season has the locals talking about taking on more employees in 1997 (the coming season).

The school had one Apple IIE computer prior to the current principal's arrival in 1989, and was generally under-resourced, but in good condition with three main buildings, one of which was a demountable that was used as a library.

Rob was appointed from Wilson, where he had observed the growing importance of technology in school education. He also recognised that because of the nature of the region, over half of his students would be sent away to private boarding schools at the end of primary school and that they would need some exposure to computers in order not to be disadvantaged.

Two years later, the school purchased their first Mac computer. It was used mainly as a word processing tool. During his teaching career, Rob had seen lots of children, particularly boys, become disheartened by having to redraft their work, creating a disincentive for them to write at any length. The computer struck him as being a possible solution to this dilemma. While he had no knowledge of Informational Technology himself, he did a short Mac course and was inspired with the possibilities of what could be done with computers in primary classrooms.

He purchased a digicard system from a high school in Wilson and began collecting and linking discarded Apple IIEs to provide the Infants school with a writing laboratory.

With the NSW Department of School Education funding model shifting to individual school discretion in the late 1980s, Rob saw that he had a wonderful opportunity to significantly upgrade the school technologically.

Ironically, at first parents were reluctant to go with the idea of computers as a school focus. One of the principal reasons was fear: "We don't want our kids any smarter than we are!" was the oft repeated though short sighted rationale for such resistance.

Rob arranged for a regional computer company representative to visit the school in 1991 and put on an evening display for the school's Parents and Citizens Association. Despite intensive lobbying of both his students and their parents, not one local turned up to look at the display of over 20 laptops. Undeterred, Rob continued to expose the kids to computer related activities at school until eventually they began to pressure their parents about buying computers for them to use at home.

Twelve months later, a similar computer display had to be held over two nights at the local Bowling Club in order to cater for the numbers who wished to attend. From that point on, Rob ensured that he had a fair idea about the current attitudes of members of the P&C before pressing ahead with further technologically grounded initiatives or purchases. Since 1991, he has spent in excess of \$20,000 on Information Technology related items.

There are still occasional parent concerns expressed about the apparent shift in emphasis away from traditional basic skills work at the school to new and unfamiliar ways of doing things. One that tends to resurface regularly concerns the perceived loss of handwriting skills amongst the students at the school. Rob is quick to counter these claims with the argument that the students will be discouraged from submitting handwritten assignments when they go away to university, so it is better that they master keyboard skills in the primary school. Privately, he remains less than convinced by the argument that emphasis on keyboard skills has led to any loss in handwriting skills amongst his students. The fact that the school continues to perform

consistently above the state average in the Basic Skills test in English literacy would seem to support this view.

One interesting feature of the CPS program is that Rob has noticed that boys are more motivated by computers than girls. He is unsure about the reason for this but accepts that it may be because he models them, whereas the female teacher does not use technology in any extensive way.

Currently, the school has computers in the following locations:

**A Staff Room**

- IBM (CD ROM) for Special Ed needs;
- IBM (Departmental Oasis administrative support program);
- Canon bubblejet printer;
- Mac Powerbook laptop;
- new Mac Performa (still in packing case at time of visit).

**B K-2 Room**

- 7 Apple IIEs;
- Image Writer II printer.

**C Yr 3-6 Rooms**

- Enclosed Verandah
  - 3 LC II Macs;
  - Mac Classic II;
  - Stylewriter printer.
- School store room at rear
  - Power PC - Performa Mac 5200 CD (Modem/Internet access).
- Classroom
  - 4 Apple IIEs;
  - 2 Image Writer II printers;
  - IBM;
  - Mac LC 575;
  - Colour Stylewriter 2500 printer;
  - combined TV/video system on moveable trolley out front.

The computers in the enclosed verandah space were formerly housed in a demountable building used as a library adjacent to the staff room. The students had access to these facilities during lunch-time and recess because they could be readily observed from the staff room, and—because there was ample space—they were well separated from one another. The wiring had been completed for all the computers to be networked when early in 1996, the local district office in Wilson informed them that because of the drop in the number of students in the school they now only rated as a

"two building" school. They were instructed to empty the demountable of its contents and shortly after that, a truck turned up and carted their Library off to Sydney.

All the Library materials were thrown into boxes and stacked in the remaining classrooms, under the sinks on the Year 3-6 verandah and out in a back shed—where they remain. Rob maintains they have no place to store them. Even the gym mat equipment is stacked out on the open verandah outside the staff room where it is exposed to the weather and whoever might take a fancy to them.

These events have left the school visibly demoralised as far as its literacy program is concerned. It also means that the PCs on the Year 3-6 verandah are sitting on school desks, with insufficient power points to operate them, and open to damage from heat and rodents. Because they are crowded together, students are now denied access to them during lunch-time and recess as they are no longer able to be supervised, and their close proximity invites students crowding around them, increasing the likelihood of damage to hardware during use and limiting the amount of collaborative work that can take place.

### **3. The policy context**

Having a school of 25 pupils appears to have led to the view that policy documents on technology at CPS are unnecessary. Resourcing and curriculum decisions are made by the Principal who makes it his business to find out as much information as possible about Information Technology developments and then proceeds to push it with the P&C. He has really promoted literacy and technology at the local school budget level. This is reflected in the latest CPS Annual Report for the DSE: "We have continued to focus on the improvement of Basic Skills of all children and emphasised Computer Education, with each child having access to a computer and the children in the Lower Division having equal access with those in the Upper Division". Later in the Report, however, Rob points out that growth in the computer technology project has been put on hold due to lack of space particularly brought about by the removal of the Library demountable.

Most software is purchased as a result of word of mouth recommendations in the district, information from commercial catalogues or demonstrations by salespeople. According to Rob, in this respect, previous regional technology consultants had not been particularly useful but a new appointment has just been made and already he has proved to be more than helpful in assisting Rob with networking some of the existing equipment and trying to get more usage from the computer connected to the Internet. In Rob's words, "We are fortunate in getting a fellow like him who is familiar with and who has had a lot of experience in using both IBM and Mac technology".

For small item purchases, Rob allows teachers to order at the point of need. In an attempt to compensate for this perceived sense of isolation, he encouraged his staff to get involved in the NSW Department of School Education's TILT (Technology in Learning and Teaching) program. While there have been aspects of this that have particularly benefited them, lack of a reliable Internet connection and the haphazard

functioning of the school's satellite dish have produced a number of frustrations as they compare what they could be doing as a school with what the current technology limitations allow them to achieve.

Because the Principal is supportive and was the one who established a technological presence in the school in the first instance, the emphasis on technology is strong. However this remains an unwritten policy and there are no plans to develop a formal school policy in this area unless there is an unforeseen increase in the school budget and the Principal is given time release to do so. For now, there are more pressing concerns, like what to do with their scattered and rapidly deteriorating library collection. Rob applied for a \$46,000 grant from the DSE in order to build another room to house the Library and technology centre. His application was approved (on a 50/50 basis) early in 1997. The Department agreed to match whatever the school could raise. Rob has managed to pick up the required \$23,000 from the P&C, additional community support, and by reallocating funds from the school's operating budget. The foundations were being poured at the time this report was finalised.

#### **4. The practice**

Commentary about the classroom practice at CPS must be qualified with the acknowledgment that these observations took place only a few weeks prior to the end of the school year. Consequently, there were other pressing concerns impacting on what we saw such as preparations taking place for an extended excursion, practice for the end of year school concert and the organisation of various sporting activities. Nevertheless we were assured by both staff and students that what we were observing was representative of what had been happening throughout the school year.

The class immediately after lunch is a timely example of the methodology being adopted in this school. The teacher (Wendy) ushers the Primary school students into the classroom and directs that those who wish to listen to her reading *Storm Boy* may sit on the floor or at their desks. Seven students choose to listen while three students move quite naturally and unapologetically to the back of the room where they settle down in front of their computers. Another three move out on to the verandah where the Mac computers are. This procedure is obviously not being put on for us as they appear utterly unembarrassed about choosing to do their own thing and soon appear undisturbed by the teacher's background noise.

One of these students is a Year 4 girl who quickly gains entry into a *Claris Works* painting file. She is not working on anything in particular at present, in her words "just mucking around", but it is purposeful as she is going to do some illustrations for a friend's Christmas card. This student is often called upon by others as she is recognised as having superior artistic ability.

Two other children have paired up at another computer and are busily engaged in using *Treasure Maths*.



Inside the classroom, a Year 4 boy is engrossed in the story he is writing. When questioned about this activity, he says he produces on average a one page story every second day on one of the AppleIIes using the *Magic Slate II* software.

Another girl in Year 3 is constructing a Christmas card using *Claris Works*. It is evident from what she achieves during the observation that she is very competent at importing and reformatting graphics, clip art or text. Rob has a strategy of encouraging the younger students to work in tandem with the older ones—in this case a Year 6 girl (Rogoff, 1990). He claims that it ensures that skills, ideas, etc. that he has passed on to students over time are not lost when the Year 6 students leave the school. They pass on their knowledge and skills to a younger colleague so that the school ability base continues to regenerate itself and serves to prevent him wasting time by having to constantly repeat basic usage instructions.

Rob alerts us to the third student working at one of the computers—a Year 5 boy. He too is trying to shape a narrative. His is an interesting case as before his arrival at CPS, he scored very poorly on the Basic Skills test. Since coming under Rob's charge and being immersed in the use of computers, he is now writing stories of a page or more every day. Rob is a little annoyed with him as he ended up missing the Basic Skills test this year through illness, so CPS was unable to boast about the meteoric rise in the student's Basic Skills score!

Wendy—the teacher reading *Storm Boy*—is a casual teacher who relieves the Principal one day a week and works with the Year 3-6 class. Since the library building was removed, Wendy has become adept at using encyclopaedia software. The print based encyclopaedia is actually situated in one of the classrooms but is evidently not used very much. Because of the number of computers available, students now prefer to use the CD ROM facilities for this kind of information. Both the interviewed students, Gary and Erin, expressed their preference for using technology in their assignment work, though they apparently rely on it mainly for finding information.

The most pressing concern for Wendy is to find software to suit individual student's needs. She has been able to put some time into learning what the technology is capable of, including setting her students to work with appropriate software. She finds they enjoy this work because the computer does not chastise them but simply prompts them to repeat a step, then praises their success.

Wendy is also impressed with the ability of word processors to make student writing more professional in appearance. Students enjoy the fact that it's not a permanent record of what is "wrong" with a story and that it can be readily changed to being "right". Students also enjoy the opportunities the technology provides to produce texts and then discuss them before making such changes. Part of the strategy for having such a heavy emphasis on word processing stories is for individual students to build up their own personal spelling lists to be worked on at home.

Five years ago Wendy was using Apple 11E computers purely for teaching students to write narrative but since the introduction of Mac computers she has been using a greater variety of software.

Wendy believes that print literacy will remain the dominant form and that kids will always have to learn to read (Vitanza, 1996). She recognises that the new technologies provide a variety of ways of reinforcing reading skills but she is currently looking for software programs that will assist those students who can perform the mechanical task of reading but who lack comprehension skills.

Rob's emphasis in the classroom is on the development of research skills and competence in the use of word processing. He uses the IBM programs *Phonics Alive* and *Animals* for the slower readers. Rob saw the possibilities of using technology when he was Assistant Principal at his previous school where computers were distributed in classrooms rather than placed in labs. The difficulty he was getting teachers to use the technology across the KLAS; they tended to remain locked into thinking that its sole use was for student word processing.

Rob's students enjoy using computers in their learning. They think that computers are good for story writing in that they provide a more interesting way of addressing the traditional print literacy skills of spelling, reading and writing. They make regular use of *Claris Works*, dictionaries, *Windows '95* and *Microsoft Word*. Classroom observations revealed kids working on individual projects and stories during the vast majority of class time. The 1:1 ratio of computers to students allows for such extended usage and releases the teacher for individual conferencing and tuition.

Like him, Rob's students see technology skills as being integral parts of their own futures. Erin believes she will be doing ". . . everything on computers" when she grows up and that everyone will own one. She envisages technology saturating all aspects of human endeavour from banking and budgeting to use in cars so that drivers can instruct the vehicles to ". . . take them wherever they wish to go".

Both Erin and Gary acknowledge that they probably have more access to technology at CPS than do most Australian school children. Significantly, they don't feel as though they need to use more of the technology as in Erin's words, ". . . we have a good balance now". Gary says that he uses the new technologies ". . . all the time . . . every day". Nevertheless, both children believe they can become more efficient users of technology in their schooling. Asked if they liked using computers, Erin responded that she does now but ". . . once they were my worst enemy!". Even now, she sometimes needs help. Pressed about how she might improve her efficiency, she opted for having a specialist sit with her for extended periods of time.

Gary, on the other hand, admits to becoming frustrated with technology at times but that yes, he does think computers are ". . . pretty good". He is proud of the fact that he can help other kids even though he's only in Grade 5 and that ". . . I can help Mum and Dad". His self prescribed solution to improvement is ". . . practice and lots of it".

Out of school time use of technology for these two students is part and parcel of their lives. While Erin's access is apparently restricted to ". . . at home sometimes", she admits to doing most of her homework and other school related tasks on their Osborne computer at home. Similarly, Gary sometimes does his homework and stories on their home based IBM compatible, along with playing games for up to two

hours per week. His first contact with computers was at home, and his father showed him how to use one. Now, he ". . . learns most from Mr Rob and sometimes Mrs Wendy, the relief teacher". Erin relies on Mr Rob and her brother James for assisting her with problems she has in using the technology.

### **5. Distinctive features of the practice**

Many of the CPS students have managerial aspirations either in the town or on neighbouring farms and recognise the need to become familiar with the new technologies. While data entry and word processing skills are necessary, it's also very important for them to be able to deduce information for business purposes. Wendy says that the kids in this area will be unemployable unless they become computer literate. Rob says that fifty percent of the kids go on to University therefore they need information technology skills. Indeed, even those that go on to labouring positions on farms will need information technology skills as all of the latest cotton headers employ satellite technology. One of the major frustrations identifiable at this school is their knowledge that they have the hardware to be able to utilise the Internet in the potentially exciting and rewarding ways they have heard about via the TILT programs but that as yet the limitations of the phone lines prevent them doing so.

All the business in the local area is done on computers so in order to feel confident about their futures, kids need to develop their technology skills. Prior to Rob's arrival at the school there was little by way of technology available, and the students' learning was limited by individual teacher's abilities and interests. Now with both the hardware and software available, teachers are fulfilling the role of facilitator rather than active instructor.

As Wendy points out, because CPS is such a small school and the school emphasis on technology has been so pronounced, student access is well above the state average. Even the Infants have one computer (Apple IE) per child, which the Principal deems sufficient for elementary learners despite the age of the technology.

When the library building existed, access might well have been the envy of the vast majority of rural schools, however this has changed somewhat. There is little out-of-class access available now because of the supervision problems created by the changed location of the hardware. In keeping with other findings about the role gender plays in the current generation of school children's interest in technology (Wheelock, 1994), there was no observable gender exclusion; equal access exists for girls and boys, the only possible distinction being as Rob notes ". . . that boys like games; girls don't". He admits that this may say more about the nature of the games purchased so far than about gender technology preferences.

Rob admits that despite his push for technology, he has resisted allowing children open access to the computers at lunch-time for quite a different reason. Being a small school with a remarkable sporting history, he has found that given the opportunity, kids will concentrate so much on technology that they lose interest in playing sport. It is a matter of some community pride that the school is the current

holder of the Macintyre Shield for swimming, and that pupils represented the North West at the State Carnival and helped win the Gold Medal in the P5 relay. In addition, one 11 year old student won the 50 metres Breaststroke title and was selected in the New South Wales Pan Pacific Games team. The school also holds the Macintyre Athletics Shield and won the Heferen Shield at the Wilson Carnival. There is now growing community support for his technology push and he is careful not to place this in jeopardy by allowing a much stronger community perception about the district's sporting prowess to be eroded away.

## **6. Issues and implications**

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.

Wendy feels that the school still has some way to go in addressing this. Some parents felt that use of the computer for word processing would result in a decline in handwriting skills however Rob's observation was that handwriting skills had never been good therefore the computer could not be blamed for any such decline. He also believes that Informational Technology will increase reading skills because students are motivated to use the technology which then requires reading skills to operate it. This particularly applies to the reluctant reader student cohort, a factor that the teaching staff find exciting.

While Rob believes in instilling traditional literacy skills in his students he is using the new technology to achieve this and thinks this kind of blending of the new and the old is done better at CPS than in ninety percent of schools he is familiar with. He notes 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.

Again, because of their isolation, both teachers feel that there is little collegial support available to them, which in turn further exacerbates their sense of isolation (though this promises to change with the recent appointment of a new regional consultant.) The isolation also hampers the purchase and installation of new technology yet at the same time provides opportunities for additional funding through such programs as the Country Areas Program (CAP).

Another issue faced by the school is the necessity to support both Mac and IBM computers. Much of the educational software available on the market is Mac based, while the Agricultural software used by the community at large is mostly written for IBM compatible hardware.

The school's isolation is also the major reason for the difficulties experienced in accessing the Internet and in getting the technical support they feel they need to keep things running satisfactorily. The local telephone lines are incapable of carrying the

volume of traffic for the area. While the school is hooked up to the Internet, Rob can only gain ready access in the early hours of the morning, and even at this time the connection can be unreliable. For this reason the students and staff have not been able to use email to link up with other schools or participate in online projects. These difficulties go a long way towards explaining the limited range of current uses of the technology.

## **MULTIMEDIA SUPPORT FOR MULTICULTURAL STUDENTS AT CARLISLE PRIMARY SCHOOL**

### **1. *The study at a glance***

The research at Carlisle involved two different classrooms in this large, multicultural public school set in western Sydney where 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.

The second report is of a Years 5/6 Composite Class of 30 students which 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.

Both studies confront some practical issues involved in ensuring access for all students to computer hardware and to a range of software packages.

### **2. *The site***

Carlisle Public School is situated within the School District of Fairfield in Sydney's West which has the largest student population of any of the State's 40 districts. The school serves a multicultural community of over thirty nationalities with the largest groups being Vietnamese, Chinese, Khmer and an increasing number of Serbians. Over 90% of the students come from non-English speaking backgrounds. The school is proud of its partnership with the community.

The community has 40% unemployment with a large proportion of high density housing and is characterised by a 30-35% transient population. Families are considered by the principal and staff to be supportive of the programs run by the school. The population of the school has been gradually decreasing over the past five years from 700 students to approximately 560 in 1996.

The school is run on a K-6 basis with the staff grouped into 3 interactive teams. The first team is made up of classroom teachers including the school's executive, Librarian and Release from Face to Face (RFF) teachers. The second is known as the Literacy Learning Team. This team consists of support staff including ESL teachers, Support Teachers (Learning), Ethnic Aide, and the School Counsellor. The third team includes

such members of staff as the School Assistants, General Assistant, and Community Nurse.

The school day is divided by two breaks. In keeping with the school's sun policy lunch is eaten at 11.00 a.m. during a 55 minute lunch break. An afternoon recess is held from 1.40-2.00 p.m. In this way students are indoors during the hottest part of the day. Students are free to eat at either of the breaks. Judging by the relaxed atmosphere in the classroom, playground and around the school, the students have an harmonious relationship.

Because of its multicultural nature the school has been classified as a *Special Fitness* school which means that staff can be selected according to locally specified criteria. The school has been part of the Disadvantaged Schools Program (DSP) for some time, giving it access to additional support such as funding for a DSP Technology consultant to run a series of workshops (8-10 days over a semester) on Multimedia, Hyperstudio, digital cameras and *Claris Works*.

The school has a DSP funded program called A Balanced Literacy Program in which the support staff have formed a Literacy Learning Team. Technology has been used by this group to support students with learning difficulties.

### **3. The policy context**

The curriculum committees in consultation with school staff make decisions on the purchase of resources. Although the computer co-ordinator and computer committee have an influencing voice in all computer technology purchases, anyone can make informal representation to the committee. Software is purchased through KLA budgets, to match action plans. The English Management group for example has purchased *Wiggleworks* (Scholastic Australia) which worked particularly well with input from the Literacy Learning Team and in 1:1 student interactions.

The Department of School Education's Computers in Schools Policy (CISP) has influenced the school's computer technology purchasing decisions. Under CISP every school will eventually have a ratio of one computer for 14 students (this may differ in the case of schools catering for students with special needs). In addition in semester 2, 1996 every school received an Internet machine, a connection to the Internet and a one day University based training program for the school's Internet Contact Person. This school received a PC Internet computer but would have preferred a Macintosh. Based on economic realities the school had previously decided to support only the Macintosh platform.

Also funded by CISP the school has been allocated 11 places in the Technology in Learning and Teaching (TILT) program. TILT is a NSW teacher development program for 15000 teachers across the state. Its target group is teachers who are not currently using technology in the classroom.

The school recognises that being literate in one's first language is important to becoming literate in English. The school therefore offers community language programs in Chinese, Vietnamese and Khmer. These programs are supported by technology and appropriate software.

#### 4. The practice

##### Classroom 1 (Year 2)

This is a works-in-progress kind of classroom, with a feeling of ownership by students as much as by the teacher. The walls and chalkboard displays include: class rules (We all win when we—stay in our seat or right place—raise our hands and wait— . . . ) which were negotiated together at the beginning of the year and are referred to when appropriate; day and weather chart; literacy hints and processes (How to build a good story, think of a three storey building—ground floor (ooh aah) first floor (uh oh) second floor (phew) . . . ); and many pieces of students' drafts and brainstorm.

Sticky taped to the carpet (with frequently reused sticky tape) are eight battered A4 pages (6 down and 2 across) depicting a flow chart showing how to use *Kid Pix*. Students refer to it and step over it all day, sometimes taking pages over to the computer for reference. When a page accidentally gets flipped over someone rights it and pats down the sticky tape. At the end of the day someone takes it up and puts it away for future reference.

Strings, from which hang students' work, criss-cross the room, which seems dark and small despite windows down each side. The desks and chairs are arranged around the sides, there's a teacher's desk in one corner. However the teacher spends most of the day seated on the floor either beckoning students to him or being joined by students who need to discuss an aspect of their work. There are two computers, one, a Macintosh Performa 580CD with a screen around it is immediately to the right of the doorway; the other, a Mac Performa 400 (which belongs to the teacher) is on a desk at the back of the classroom. There are 22 students in the room.

On this particular day the teacher has lost his voice. Despite what would seem to be a decided disadvantage the classroom activities progress successfully and without any obvious disruption to the teaching learning process.

Doug is a teacher of nine years experience who is currently doing a Masters in Literacy and Technology. Seven years ago he was the computerco-ordinator in a lab with tape driven Microbees. At that time there was little or no computer technology in the classroom. Whole language programming was the major focus and genres were just beginning to emerge through DSP and PETA (Primary English Teaching Association). Doug's school ran a cooperative learning program, literacy program and a behaviour modification program.

Today computers are used as an integrated part of the school routine and have almost become invisible. Having better access to technology enables Doug to provide better access for his students, who are now also involved in the planning stages. Computers are also used for professional purposes, such as administration and the preparation of student materials. Literacy teaching now uses text types in a more relevant way and Doug feels he has a better understanding of this.

As the observation below validates Doug sees himself as creating purposes for learning, "I want to facilitate, develop trust and challenge students while providing support. I hope to develop a cooperative classroom with open ended learning opportunities so we can all learn together." He allows students to interact freely and to negotiate solutions to problems and issues (Bennett, Rolheiser-Bennett, & Stevahn, 1991; Walker & Brown, 1994).



9:40

Doug's early morning class is involved in small group (mainly pairs) collaborative writing activities. Each pair is to publish a page of a jointly constructed retelling of *The Magic Flute*. The pairs comprise both mixed and single sex. Individuals move between groups as they require resources or assistance. Each pair has a large piece of white chart paper, pencils, crayons, Edicol paints, scissors and glue. The teacher is seated on the floor with 2 students. A student at the computer calls over to him, "We did a mistake, we're stuck in this passage". He goes over to see what the problem is.

9:45

There are two computers being used in the classroom. One is a Macintosh Performa 400 with an external microphone attached. The other is a Macintosh Performa 580CD. Both are running Kid Pix Studio.

Computer 1: Two boys are preparing a slideshow of previously saved individual pages of a story. These pages already have illustrations and text. Child 1 obviously has more experience in using this program and when Child 2 takes control of the keyboard the following conversation ensues:

Child 1: You don't listen to me

Child 2: What?

Child 1: You still don't listen to me....down, DOWN...Now click!

(Indicates transition he wants between the slides)

Child 1: Not yet! Don't click!

Child 1: You pressed cancel....Let me do it

Child 2: All right...I'll listen

(Girl intervenes as she is attracted by their loud conversation)

Girl: You're doing it wrong ... Show me

Teacher instructs girl to move back to her own work explaining that they need to learn for themselves through experience.

The finished slideshow is a variation of the Three Little Pigs, using text, graphics and sound.

Doug believes that computers are tools for students to access information and present their own information. "They are one more resource for students and teachers to use," he says. "They are an important part of the future and help develop divergent thinking strategies. They provide access to different ways of writing and reading and investigating. 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).

Two girls are at the second machine. They are drawing a sun but have deleted their first attempt because they have mistakenly filled the sky with blue. They refer to the flow chart on the carpet, then move back to the machine. They take turns to draw referring to their storyboard. They try a number of ways to draw the sun, deleting it several times.

G1: I know how to do the sun, draw two clouds and just show half of it.

G2: No, press goodies and pick a stamp— have a smiley sun.

G1: Stamp it at the top of the page ... no rub it out it's too small.

G2: Wonder how you make it bigger?

They draw the sun again. The teacher requests that they work more quickly. They draw an outline of the sun and fill it with colour.

G1: At last!

They draw two clouds.

Four children have now joined the teacher on the floor.

10:00

Teacher is called to the boys' computer because the sound previously recorded by the boys does not play. The teacher examines each of the files himself without saying anything to the boys. After finding the problem, he asks a series of questions designed to lead the boys to their own solution. They find they have to reload each slide because they had selected a "no sound" option.

The slideshow is replayed but the boys aren't happy with the results because the sound is too soft.

They decide that at their next turn they will re-record it.

Doug observes that life-long learning will be essential for these students and that literacy skills will be needed to continue the learning process. He realises that the transference of skills from one platform to another is vitally important and that technological jargon will become more a part of everyday use. "Information skills will become more important," he says, "and students will need to be able to scan for key words and be able to do searches. They will also have to be able to "read" all of the media, making use of pictures, sound, text and video".

10:10

Two girls take the place of the boys at the computer. They are at an earlier stage of the same activity. They have preplanned a narrative using an eight panel story board. From this paper based draft they are preparing the slides using drawing and painting tools in *Kid Pix*. They draw a purple stegosaurus with a red mouth. They delete it 3 times then retrieve it and change the colour to yellow. Finally they type in the title *Marie's Dinosaur*, by Marie and Lin.

The computer groups have all been single sex. Doug comments that all groups are chosen by the students themselves. They move in and out of different combinations quite naturally working in mixed and single sex groups as desired.

Students at this school use computers from Kindergarten on. One eight year old girl said that she learnt to "do" the computer from *Kid Pix* in Kindergarten. "In Year 1 I learnt about hard drives" she said, "and slideshows in Year 2."

Doug sees the computer as part of a non-threatening environment that provides instant reinforcement, especially with drill and practice type activities. There is no sense of failure associated with the use of this technology, children feel that they will quite naturally get better as they get older. "It provides training for students in the use of a range of strategies; it gives students more control over their writing and encourages greater editing because the computers make this so much easier to do. Doug acknowledges the need for schools to teach typing skills but is quick to assert that there should be an equal emphasis placed on handwriting and word processing.

Around the room pairs are still working on the *Magic Flute* task. One boy is using a lettering book to create a heading for his text. The teacher is sitting on the floor working with different pairs discussing their illustrations and text and exploring their intentions. Two boys ask him whether or not castles had windows. He continues to interact with those who come to him seeking assistance and is occasionally called to provide assistance to one of the groups at the computers.

10:20

Students on one of the computers are rehearsing the voice over for their story and decide who will read this time. They call out in a sing-song voice indicating a familiar routine, "Re-cord-ing". The teacher raises his hand, the students follow suit and the class falls silent (while continuing to work with one hand!) as the child reads texts for the slideshow (approx. 10 secs).

Child 1: ....and all the other reindeer. Santa Claus

Teacher: That doesn't make sense.

He joins the girls at the computer. Discussion follows about the the sentence being incomplete. They discover that the rest of the sentence has actually been written but it appears on the next slide, incorrectly continuing with a capital letter. The teacher addresses this; several steps are involved in the process. Students continue to work in silence with one hand in the air, until a voice sings out "Fin-ished". The class resumes activity at the previous noise level as the girls practice the next slide.

G1: ..... bring the present in the night

G2: Presents ! Look there's an "s" on the end

G1: Re-cord-ing (singing out to the class) ..... bring the presents in the night. Fin-ished (again singing out).

The second girl coaches her partner in reading the next page.

G1: Santa climbs into the chimney and gives us presents

(The teacher calls out from the floor to say it more loudly.)

G2: Re-cord-ing ...

G1: Santa climbs into the chimney and gives us presents

G2: Fin-ished.

The second girl records the next sentence and they go on taking turns until all slides are finished. The students play their show then save their work and leave the computer.

G1 when interviewed later commented that computers made recognising the letters of the alphabet so much easier, "You can see the letters on the computer keyboard," she said. Use of computers gave her the confidence to have a go because, as she said, "It doesn't matter if you make a mistake, you can always press delete."

Other students agreed, they unanimously liked the idea of the *oops man* in *Kid Pix*. As one 8 year old boy said, "Writing is easier. You only have to press a button to make a letter and Delete to fix a mistake. It's quicker."

It is through processes like the above and inclusion in classroom planning that students gain a feeling of ownership of their work which Doug sees as essential. "We have always professed to give this to them but now they demand it," he says. He believes there has to be more use of logical thinking skills, flow charting, planning, story boarding, and he thinks it important to identify audiences for slideshows thus allowing for a variety of purposes for students' work.

## 5. Distinctive features

This classroom operates as a diverse but cooperative community where teacher and students have common goals, so that when the teacher signals a change of activity (e.g., lunch time) it is completely accepted that the members of the community will

take responsibility for whatever needs to be done to make ready for the change. The excerpt below typifies this very natural classroom dynamic.

Two girls at the second computer have drawn a girl on the title page. They've used stamps to put holly in her hair.

10:53

An individual conference is held with a student and her completed story board. The teacher looks at the clock and says "Pack up if you're finished and come and sit on the floor. Put a paper clip in your work." The students help themselves to paper clips from the teacher's desk drawer. He continues to talk to the small groups as they come and sit on the floor. Students gradually pack up and join the rest of the class. A boy accidentally shifts the flow chart on the carpet, the teacher gives instructions for putting it back.

Teacher prompts girls on the computer, "... finished that page yet? ... I wouldn't use that sort of paintbrush to do that ... draw it with the pencil and fill it with the paint bucket. That's it. You've got it."

Doug doesn't think that changes are needed to accommodate new technologies as long as information technology is seen as being integral to learning. "You teach whatever is necessary, however teachers need to take the time to ensure that they know what is happening in technology. They owe it to the students to teach with technology. Because the computer is on all the time this changes the organisation of the day. It has to be integrated."

"We also need to work with the community and do community training if possible. Responsible use of the Internet (at home and school) needs to be taken into consideration. Students teach themselves and each other. Everyone helps everyone else (Kim helps Danny with his language) they try things out."

12:05

The teacher is outside the room talking to a student. He calls in through the window that it is DEAR time. It is also home reading book changeover time. By the time the teacher enters the room the whole class is reading. Doug uses a *Claris Works* Database and enters data as students present books to be borrowed. The books are numbered and these numbers as well as titles are entered against student names. Four boys are on the carpet reading to each other. Two students are on the doona and cushions. The rest are at the tables reading in pairs.

12:20

The afternoon is devoted to free choice activities based around class study themes. The students set up the dinosaur game, the *Ancient Egypt* game, *Battleship*, *Mastermind* and chess. Some take the cushions outside in the shade. A boy and a girl play chess. Students have recorded their Ancient Egypt research in Hypercard stacks and some look through these. Others play their slide shows reading along with the voice.

1:15

During free choice activities one group (2 boys and 2 girls) is using the built in recording facility in the Macintosh. "You said 'bo" not 'box"... "Not Lizet....it has a 'd"... lizard".

(Peer correction seems to be accepted by all as being a natural part of a supportive, non-threatening classroom environment.)

## 6. Issues and implications

Being the computer coordinator and facilitating workshops for others has meant that Doug has had to keep up with new technologies himself. However he stresses that teachers need more time and more computers and that schools still have a long way to go. “We need to get computers into every classroom and school,” he says.

The rate of change in technology is a related issue for Doug. “This generation is coping with the change,” he says, “but teachers don’t cope so well with such rapid change. We need to try to keep up without losing people. As with any paradigm shift this means more work initially but then it becomes part of who you are”. Doug takes responsibility for his own learning but sees both colleagues and students as part of an interdependent network of support in achieving this. The ideal situation for him is an environment that supports risk-taking and professional dialogue.

Doug sees relevant training and development opportunities as ways of helping teachers learn to cope with change. He also cites increased technical support to schools and a greater awareness by school administrators for the need for timetable flexibility to maximise use of limited resources as other important contributors. He also sees it as imperative to increase the amount of preservice training in the use of new technologies.

## 7. Practice

### *Classroom 2 (Year 5/6)*

Furniture is arranged in this small classroom so that the thirty students and their tables leave space for an area to congregate on the floor, a reading area, student display tables, storage and the rest of the clutter of a normal, busy classroom. The windows on one side look out over a grassed area and at the other side onto the asphalt playground. Blinds at the windows on the playground side are tattered but probably only ever noticed by a stranger; students and teacher alike are too engrossed in their work to notice. They are far more likely to point out the students’ art work at either end of the room—tributes to Van Gogh’s *Sunflowers* over the chalk board and Monet’s *Waterlilies* on the opposite wall—one of the outcomes of a study of the work of these painters. Hoops hang from the ceiling serving as additional display areas for student work. An easel and whiteboard stand in front of the chalkboard. Across one corner at the back of the room is “Kim ‘n’ Dot’s easel” displaying their project work. The two girls made the easel themselves from recycled material, blue paint and glitter.

A Macintosh Performa 580CD with a Stylewriter 1200 printer sits under the chalkboard. A second one (Mac LCII with colour monitor) is wheeled out from the store room by one of the boys first thing in the morning and the dividing screen by the door is rearranged to make a booth for it. There is a teacher’s table under the window although the teacher spends much of the day at the students’ tables. Of the 30 students, 19 are in Year 5 and 11 in Year 6, and 10 have been in Australia less than 6 months. Ninety per cent of students in the room are from non-English speaking backgrounds. Students’ unselfconscious use of home languages throughout the day indicates the school policy of support for students’ first language and the fostering of

pride in being bi or multi-lingual. For example two boys working through *Wiggleworks Stage A Level 1* at the computer, after reading *The Noisy Breakfast* record their own version of the text in their home language (See Gibbons 1991; Hajisava & Mansfield, 1992).

Kathy is currently doing an MA majoring in Literacy and Technology at the University of Western Sydney and is coordinator of the school's Literacy Learning Team which means that she has opportunities to keep up with both the literacy and the technology. She sees her role in the classroom as facilitator of the development of independent, self directed, cooperative learners. She is passionate about promoting the development of divergent thinking processes. She believes that computer information technologies will be an integral part of students' future lives and that evolving technologies promote lifelong learning. She is also committed to providing advanced reading skills such as skimming and scanning strategies.

While Kathy acknowledges that sound teaching practice has always aimed to empower students she also believes that a shift is required in teachers' thinking, "We need to move away from the old 'copy it down and make it look pretty' to more interactive and divergent methods." She feels that teachers need to take time to become confident and comfortable with the new technologies and that they need to take the community on the same learning journey.

Kathy's teaching is changing to accommodate the new literacy demands, "I'm adding more logical, explicit, planned for experiences, for example incorporating the use of storyboards for slideshow presentations. I think more consideration needs to be given to the audience for texts. I have to plan for more flexible use of time, especially computer time. Increasingly I integrate curriculum components which means coping with students doing different things at different times. And I think my teaching is more developmentally based—using learning continuums. Learning is becoming more individual, there's more use of peer tutoring. It's a two way learning partnership."

"Ten years ago" says Kathy, "we had an Apple II lab and the RFF (Relief from Face to Face) teacher taught computers. This was the only access to technology in the school. At university we used punch cards. In terms of literacy teaching the focus was on pen and paper. We used reading books but no computer technology. We had reading groups with set graded readers. Reading was separate to theme work. Activities included unrelated comprehension and cloze passages. We had Friday morning spelling tests, SRA reading cards, Spell On text books and a 'pretty' handwriting book."

Currently Kathy's teaching addresses individual needs. "We have undergone a complete revolution in teaching practices. I now have a totally different teaching philosophy and a better understanding of how students learn. . . student involvement has increased in all areas of planning learning and assessment". In addition her own professional work and administration is nearly all done on the computer (see Dwyer, 1995).

Kathy is comfortable using new technologies in her teaching and feels good about her current levels of understanding. She realises it is impossible to know everything and her views on literacy and technology are constantly evolving. Her beliefs about the impact brought about by the change in new technologies come from an amalgam of media reports, discussions with colleagues, professional development courses and her own personal beliefs and experiences with computers. In the future she looks

forward to easier video editing, greater use of animation and graphics, an increased use of the Internet, and the involvement of overseas schools as an integral part of communication projects.

Kathy's students report that the computer is used "a lot of the time", "all day everyday". Access to the computer is self regulated however she ensures that all students have access to the computer and a variety of software including *Claris Works* for writing, drawing and graphics, *MS Word*, *Kidpix Studio* for multimedia, *Corel Draw 5*, *Excel* for graphs and charts, *MS Powerpoint* for presentations and slide shows and *Solitaire* "just for play and a little bit of thinking" (girl 11 years). Kathy has made the classroom computers accessible to students at lunch time and before school. Students are required to present work in a variety of forms. The computer is an option to be chosen by students when it is the most appropriate medium.

One boy commented that most of their work needed computers and that "Our teacher wants us to learn to use it all by ourselves without any help." This seemed to give students confidence. Another student commented "definitely it's all my efforts that help me." Kathy encourages her students to be independent workers seeking assistance from peers as well as the teacher and again she encourages them to explore the assistance available from the medium itself. As one boy said, "At home I just open the computer up and just look around. That's how I learn, I teach myself."

Asked how they could get better at using computers students emphasised practice and the fact that as they got older they would naturally get better. Those who had been in this school since Kindergarten had been using computers for all of their school lives. There was a surety and confidence in their attitude.

The following classroom observation illustrates the integrated way in which computers were used throughout the day, and the degree to which students controlled their own learning.

Before school:

There are many students inside the classroom as Kathy prepares for the day. Some are talking while others are working from a maths text. Two students are drawing and a group of six are playing a card game on the floor, four boys are on the floor playing chess. The teacher is setting up two computers. She calls three boys to take over from her. There are two computers set up in adjoining alcoves made from moveable display boards. This is the only access to a power point in the room. One is a Macintosh Performa 580CD and the other is a Macintosh LCII. The computers are switched on in the morning and left on all day.

9:10

The school day begins:

Kathy is seated on a small chair at the front of the group. She gives rapid instructions about tasks to be completed, "This morning we've got maths and reports, who's conferencing with me first? If you need to publish any work you'll need to do it on the other Mac, this one's being used for Slideshow. Off you go".

All work is due by tomorrow for the end of year reports. Some students are drafting reflections on their learning for their end of year portfolios and conferencing these with peers and then the teacher.

Three boys are working on the Macintosh Performa 580CD. They are creating a slideshow using *Kid Pix Studio*. This is their chosen way of demonstrating the understandings they have gained from the Environment unit of work. The development of ideas, presentation, editing are occurring as the boys

progress. Two of the boys decide to make up a creature from clip art body parts. The creature is magic and waves his wand over the garbage bin. They need a “ding” sound to signify a magic spell and ask the third boy to practice different voices, “Make it like an old lady’s voice”, “no you say it”, “ding like this one— you have a go.” Each of the three boys has a go at recording. They need a picture of a rubbish bin but can’t find one in the clip art. The teacher (who is monitoring the conversation from her seat at a student’s desk) says they will have to draw one.

Kathy is working with students in pairs negotiating reports for the end of year portfolios. She has an attractive report proforma which she designed using a computer and colour printer. It is divided into

Key Learning Areas and their substrands. The English section is already completed and they are now working on Mathematics. Individual learning indicators are being discussed, students suggest whether a tick should be placed in the Independently, With Help, With a Lot of Help, or Not Yet column. They must find a work sample or demonstrate the ability to satisfy their claim.

The three boys at the computer are joined by two more offering advice and different voices. They are ex students now at High School, who have called in to visit.

The Year 5/6 boys draw a bin, then write on the screen “Ka boom!!! like this one”, They record the words, one saying (after much practice) “Ka boom” the rest joining in with “like this one”. Finally (9:45 am) after much experimentation they are satisfied and save their sounds and pictures. They now organise their ten slides into a slideshow. They run through it and choose a variety of transitions from slide to slide, they pick a prerecorded sound for the flower growing, then record a sound for the sun (“phew”) and the flower (“wow”). They make the flower grow in size as the sun’s rays strike it.

Kathy: Boys how many frames have you got in your slideshow now?

B1: Thirteen

Kathy: How many do you want?

B1: Fourteen

Kathy: Have you planned it out?

The boy doesn’t answer.

Kathy: Have you? (she looks around)

The boy shakes his head.

The group continues working. They construct the final slide— a koala from the clip art collection to which they add the text “We hope you have learned something.” They record the text and try out a series of transitions. They call another boy over to watch. The show is completed. This process has taken about an hour.

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 (or as the students said, “messing about”). 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 as described or it could be Kim and Dot’s presentation to the class from their easel (the presentation included word processed texts). Although this seems to operate



smoothly in the classroom one student noted that “you have to be quick or you miss out on a turn [on the computer]”.

Kathy uses student presentations to the class (or other suitable group) to serve a number of purposes: they provide a focus and time line for work, they are a way of verifying student learning, they provide an authentic audience and opportunities for students to control their own learning, to practice oral English skills, and to take pride in their achievement. Computer technology however also makes possible for students a level of professionalism in presentation previously available only to adults working in particular fields. This could be at the level of multimedia or like the example below, word processing.

A girl is at the “publishing centre” using *Claris Works 2.0* on a Macintosh LCII to publish her Report on the Environment which is part of the contract she is working on (Comprehension section of Bloom’s taxonomy). She has drafted it on paper and has had it conferenced with a peer. She draws a line around the page then changes the view to 75% to check the effect. She chooses a font then calls softly to the teacher. When the teacher doesn’t hear another girl comes over to help. They speak together in their home language. Later the girl adds a pointing finger and a writing hand from clip art. She outlines, underlines and centres her title and again changes the font and size. By 9.45 she has nearly finished a page of typing from her draft script using a hand writing font, and the copy and paste facilities to organise her report. Her paragraphs are not indented, instead a line is left between them. She says that when she has finished she will conference the printed copy with a friend, edit the text then print out a final draft for conferencing with the teacher.

As she finishes at the computer another girl takes her place.

As Kathy says “standards of published work are improving because the chore of rewriting subsequent drafts is removed. Also we are overcoming the issue of untidy handwriting affecting self esteem and willingness to engage in writing.” The emphasis on information may be another factor in encouraging writing. Kathy believes that information skills and reading for information appear to be easier for her students than the reading and creation of fictional texts.

## **8. Distinctive features**

Kathy receives strong support from the principal and from colleagues. This creates a work context which encourages exploration of new technologies.

The school has a strong commitment to ensuring that all students are equipped to achieve success in the “information age”. Every class has a computer. In addition each grade has a shared multimedia computer. There is at least one Macintosh Colour Classic, one Macintosh with a built in CD ROM and an Apple IIE in each grade. There is also a Mac laptop and two old PC laptops with printers, and a multimedia computer in the library as well as an Internet computer. In addition there is a multimedia computer in the staffroom which staff can use at any time. This provides opportunities for sampling and demonstrating new software.

Other technology resources include a digital camera and LitePro and Laser printer as part of the Korean Through Technology Program sponsored by the Korean Government. There is a zip disk drive used for storing large files of students’ work.

The school's focus on equipping students for life in the "information age" is reflected in the importance Kathy places on information skills. For example she sees it as important to develop skills for narrowing search tasks. "We're moving beyond traditional strategies of opening a book, turning the pages from front to back and reading the text from left to right. Literacy is more than reading and writing. There is a need for explicit instruction in new information technologies."

This need to be explicit is apparent in all aspects of Kathy's teaching. She feels very strongly that students should know how her teaching is organised, know what the syllabus requires of them and what they need to do in order to progress. As she says she doesn't "want anything hidden from them, they have the pointers, [pointers are used in NSW syllabus documents as indicators of achievement of outcomes at the different levels] they know what outcomes have to be reached for each level. They know what level they're working at and frequently ask me what they need to do to move to the next level. Nothing is secret, or hidden from them. They can talk about their learning."

This is obvious in observing the class at work. Throughout the day students in small groups, pairs, or individually move from one activity to another as they complete tasks. The work is negotiated and recorded as individual self paced student contracts based this time around Bloom's taxonomy. In the past contracts have been based around other organisers, for example "Gardner's multiple intelligences". The following excerpt from observation notes will serve to illustrate.

Three girls explain that the teacher has negotiated the topic The Environment with the class. She has set them the task of designing their own unit around Bloom's Taxonomy, with different requirements depending on student ability. As an organiser Bloom's Taxonomy has been used several times already in this class. These girls had to design and complete the following: five activities in the areas of Knowledge and Comprehension, four in Application, two in Analysis, two in Synthesis and two in Evaluation. These activities were negotiated as a group then with the teacher to ensure they covered all areas of the curriculum. A mixture of group and individual work was included. When the unit is complete students will have to present all the work in an "appropriate format" which is decided by each student. Some are producing fully illustrated folders in the shapes of various Australian fauna, one is producing a concertina-like display board which folds into the shape of a flying fox, while yet another is constructing a replica worm farm into which work samples are being placed. Others are producing multimedia presentations using *Kid Pix* and *Claris Works* slideshows. Most written work is word processed.

The teacher is approached for help as necessary. Meanwhile she is working with two girls on a measurement activity, she reminds the class to write in their "pointers" for the Maths assessment task.

Kathy sees her role as promoting the development of thinking processes and facilitating the development of independent, self-directed, co-operative learners. The relaxed, self assured and enthusiastic learners observed in this classroom are testament to her commitment to these principles.

## **9. Issues and implications**

Teachers need access to, and a voice in, the debate on the nature, implications and critique of new technologies. While Kathy talks about the technology as simply one

more tool that can be used to promote learning and problem solving it is clear from her comments that she sees ITs 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).

If, as Kathy suggests, technology of the future classroom includes a greater emphasis on video editing, animation, graphics and an increased use of the Internet, pre service teachers need exposure to such possibilities to prepare them for the classrooms they will encounter early in their practice. The kind of skills this infers are the ability to transfer skills from one medium to another, problem solving strategies, collaborative work, and an emphasis on divergent thinking. Teachers already in schools will need to have access to programs and support so that they can upgrade their skills as necessary.

Kathy believes that overseas schools will become an integral part of local school projects. This is part of an overall globalisation of education. 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 has allowed.

In terms of future needs Kathy sees as crucial increased access to DSP funding, a broadening of post graduate opportunities in applications of new technologies to education and funding to provide computer workshops to support the school's teaching and learning program. In addition she sees a need for increased access to computers and more allocation of time for preparation and exploration of software and hardware resources.

In addition to the availability of relevant training and development opportunities, technical support is crucial.

### *The community*

Teachers in Kathy's view have a responsibility to "take the community on the same learning journey". She believes 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 Kathy'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. For example to demonstrate that we aren't just throwing out books for the Internet." The implication of this for teacher education is to explore the possibilities of technology in a sound educational context so that education practice is seen to drive the technology rather than vice versa. This means far more than sampling software and knowing how to use pieces of hardware. Uses of technology need to be viewed through the lens of student learning. For teacher development programs this means consideration must be given to supporting schools in their bid to include the school community in the technology debate. As a starting point packages like the National Professional Development Program's *Supporting Learning Through Technology—A Resource for Parents* should be made widely available.

### *Continuity and transition to High School*

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Another theme to emerge was continuity. Both teachers expressed a general concern for students moving within the school from grade to grade. The principal had a strong commitment to computer technology therefore continuity within the school was less of a problem than it might have been because most teachers in the school used computer technology in the classroom. However Doug and Kathy felt that if the principal were to leave then computer use may diminish. It seemed that leadership and support from the school executive were crucial factors in embedding computer use in curriculum throughout the school.

Movement to high school was 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 Year 6 may have had access to a computer all day and made choices about appropriate use. Restricted availability of computers changes 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 high school often have far less autonomy. Those with computers at home can continue learning in a play 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. But 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

### 1. *The study at a glance*

New Park Primary, and schools similar to it, dot the suburbs of Australian cities: 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 would love to make major changes but can't 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. Only 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, the students use the computers to transcribe work already drafted with pens, 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: 90 percent are 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 23 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 Grade 4 teacher, whose work with multimedia provides the focus of this case study.

These two special factors raise a number of important questions which are not exclusive to this site, questions which concern those of us who work in the less than optimum conditions which characterise many schools within the Australian public system of education:

1. How can technology be used effectively to enhance the language facility of students for whom English is a second language? Many of these students come from war-torn backgrounds which denied their parents and themselves access to basic early literacy learning.
2. How can technology get off the ground in a particular school setting when its use is largely dependent on the efforts of one or two individuals? Curriculum initiatives, which are energised and sustained by just a few key people, do not hold much promise for institutional change. The move towards technologising the curriculum requires the involvement of more than a supportive principal and only two enthusiasts who may move on at any time. Indeed, that is exactly what happened at New Park: Stephanie successfully applied for another job and the creative use of technology for language and literacy development was in limbo when the study ended.

There is no easy solution to the second question, a situation with which many readers will feel an affinity. However, this case 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. Underpinning Stephanie's pedagogy is the belief that students with special language needs thrive when given opportunities to creatively express themselves using a range of media. When audio and visual elements as well as words are combined, the students confidently and competently solve the problems associated with the making of meaning using multimedia technology. But, stresses Stephanie, there must be a reasonable ratio of computers to children. In the lab at New Park, there were enough for the students to have one each but she preferred them to work in pairs or small groups so that talk was sponsored.

## **2. The site**

Located about 20 kilometres from the CBD of a State capital, New Park Primary School is situated on a nine-hectare site shared with New Park Secondary College and New Park Language Centre. Over ninety percent of students are from non-English speaking family backgrounds, predominantly from Cambodia, Vietnam, South America, Central America and the Pacific Islands. Many families in the school community were refugees from war zones. The current population of the school is 340 students. The majority of the students come from families in which the parents are either unemployed or have low incomes. Very few students have computers in their homes. Students' access to technology is thus through the school or commercial venues such as video-game parlours.

Decisions about technology resources and budget allocations for the purchase of hardware and software are made by the School Council. Teacher committees advise the principal and deputy principal who in turn advise the council. The council then approves, within the scope of the budget, the resources which may be used to enhance the nominated program.

The principal tells me that technology resourcing is a high priority in the budget. This focus dates to the current principal's predecessor, who in the mid-80s became very interested in the application of computers to the school curriculum. They started to look at Commodores and because the school was funded through the Disadvantaged Schools Program, New Park was able to acquire a computer laboratory for the use of all the students. The first computers were Apple 11e's. The principal believes that the initial outlay provided an impetus for all that followed. A computer-informed and competent teacher made it possible to continue to develop the lab and associated activities. This teacher, Chris, was put in charge of Computers in Education and continues in this role today. His appointment is half with the computers. The other half of his allotment is responsibility for a shared Grade 5.

Most of that initial seeding money was spent on hardware and software but energy was also directed into developing programs that aimed at "enhancing" students' learning. Staff have been encouraged to take professional development courses and

two members of staff, Chris and Stephanie, have Masters in Educational Studies (Computers in Education).

### **3. The policy context**

The school's Charter is a 23-page document. The school ethos is captured in the following sentence:

“Curriculum programs have been structured to address the specific educational needs of students and to provide equal opportunities with particular consideration given to gender issues, recency of arrival in Australia, multicultural diversity and individual learning needs.”

Literacy is one of the three priority areas at New Park. As the principal puts it: “We have a fundamental, an unavoidable obligation to the primacy of the teaching of literacy skills. To that end a very significant amount of resources are given.” Before becoming deputy principal and then principal of New Park, Dave was an English Consultant. However, he is careful to point out that despite his expertise in literacy and the language and literacy curriculum, he respects the right of the practitioners at the school to have their theoretical perceptions reflected in policy and practice.

Testament to the primacy of literacy at New Park is the school's response to the large number of Cambodian refugees who came to the school in the 80s. As part of a Community Language Program, Khmer was offered to the students, many of whom arrived without any literacy skills. This program pre-dated what is now referred to as LOTE. The parents were not involved. The school focused on the students' mother-tongue language to give them something of the birthright that they had lost due to war and civil turmoil in Cambodia. The argument at the time was that by providing a conceptual base for the mother tongue, then academic learning in English would be easier. Unfortunately, it was a very fragile program and finally collapsed in 1992 as there were no teachers to follow it through. New Park was privileged to have one of the few qualified teachers of Khmer in Australia. When she left, that program and others in the area incorporating Khmer, had no hope of survival. The parents who had not been involved in the school program were more committed to their own ethnic schools so there was no support from the parent body to keep it going.

The school describes itself as “dedicated to providing a safe, caring, productive environment which promotes each student's learning development, confidence and self-esteem.”

In the summary of its curriculum programs, the school's Charter informs readers that the Eight Key Learning Areas provide the framework and guidelines. Special regard is given to TESL approaches to teaching and learning. The LOTE program is Spanish. And of interest to this case study is the statement that “computers provide enrichment to several Key Learning Areas”. Talking about future directions, the Charter aims:

“to enhance the Computer-Assisted Learning program which currently operates most effectively across all curriculum areas P-6 by extending



and upgrading the already well established computer laboratory and school-wide network system.”

The Computers in Education policy document is dated 1990. It explains that the use of computer technology in everyday life is increasing at a rapid rate. It goes on to say that technology is used in the home (microwave ovens, video recorders, television sets, home computers) and the wider community (computerised libraries, banking, retail shopping, car engines). Computers are acknowledged as used in almost every area of the workforce at a variety of levels. In the education field, it is seen as increasingly necessary for students in the upper secondary levels to be computer literate. For tertiary students, computer literacy is designated as essential.

The school aims to:

- provide access to computers for all students;
- ensure that students are conversant with the broad characteristics of the software and hardware with which they are working;
- use computers as a tool to support all areas of the curriculum;
- use a range of software which supports the relevant areas of the school curriculum;
- promote cooperative learning by having groups of children working at computers;
- assist in the development of literacy skills;
- encourage an enquiry approach to learning.

In the guidelines for implementation of the Computers in Education policy, the document specifies that a staff member be allocated to coordinate and manage the computer facilities. Further, each grade is to have one timetabled session per week in the computer room. Mobile computers are available at other times for use in classrooms.

The aim is that by the end of Grade 6, children will be exposed to software in the following categories:

- word processors;
- adventure games;
- databases simulations;
- programming language (*Logo* and *LogoWriter*);
- logic and problem solving.

The aim is also to ensure that software will relate to at least one area of the curriculum and where possible will support thematic work being undertaken in the classroom.

When asked about the interconnections between literacy and technology, the principal explains that technology is clearly embedded in all curriculum policies. The use of computers is encouraged as much as possible. He sees the technology as useful in enlivening the interest of the students and offering ways of presentation not available elsewhere.

Each class is timetabled in the computer room once a week and the teacher responsible for the class doesn't get that period off. As the school's population has

decreased, there are more computers available than in past years. The facilities aren't open at lunchtime as there aren't enough teachers to staff the lab.

The principal emphasises that although the hardware and software and facilities are very important, even more critical are the attitudes and confidence of the teachers and the "skilling up" of the teachers. It is these factors, he says, which make a difference. He points out that if he lost a few critically important people in one year then he'd have a major crisis on his hands to maintain the program. Therefore he feels an urgency to "skill up" all the teachers and give them a sense that they can "do computers" as well. But, he admits, it's really hard work. "As the technology is developing so rapidly, if you are far behind you feel as if you really can't keep up the pace."

One member of staff is designated halftime as the teacher in charge of computers. Chris has been doing the job since 1990. His own classroom is located just down the hall from the lab and he is constantly called to the computer lab to solve problems even when he's not scheduled to be there. There is no other technical support within the school. 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 that it doesn't really matter what program the students use—word processing, *Logo* or *MicroWorlds*—their language develops if they're solving problems together. If the students are interested in the activity, it seems to generate talk. Students aren't taught keyboarding skills formally. There is simply not enough time for them to experience the range of applications as well as have enough access to learn how to type.

It's of interest to note that the two teachers within the school who have a passion for technology are both trained art teachers. Chris began using *Logo* in the Art room for creating things in the late 1980s. He soon had the students using a very simple paint program for creating graphics. Gradually he began to see the possibilities for the use of computers in other curriculum areas.

Chris says that the use of the full range of technologies is rather limited at New Park as the knowledge base is simply not there amongst the teachers. A few have got access to the Internet at home, but not many, and none are using multimedia. The other barrier to further development is financial. Moreover, the computer program at the school depends on Chris and Stephanie. But it seems that there is no resentment amongst staff about the resources that are put into technology. The other staff may not be using the technologies themselves very much but they are happy for Stephanie and Chris to get support from the principal for the expansion of resources wherever possible.

Chris also believes that the use of computers has value for the students in preparing them for what they will do after school. He argues that familiarity with computers is really important for post-secondary life—no matter what shape or form, even if it's just

for banking. But it might be for other uses through the Internet—a modem for banking or just for accessing information, word processing, databases.

The living books series are used widely for language purposes in the school particularly by the ESL teachers. However, Chris describes most of the teachers at the school as “uncomfortable” with the technologies. And because of their ill ease, the potential of the computers is not exploited. The computers are used by teachers mainly for word processing and not for interactive purposes.

Chris believes that professional development opportunities are crucial. About 80 percent of activities are done inhouse. The lab has 16 computers and there are a few portables on trolleys. There are, of course, limitations with both options.

Stephanie and Chris represent the movers and shakers in this context in regard to technology. 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.

#### **4. The practice**

Stephanie does a project each term with her Grade 4 class using *MicroWorlds*. She gives very clear arguments why she prefers *MicroWorlds* to other multimedia programs. She believes that *MicroWorlds* is a powerful learning technology because it demonstrates that there are multiple ways of doing the same thing, multiple ways to solve a problem. She claims that *MicroWorlds* can assist her students’ development in the following ways:

- development and application of a variety of problem-solving strategies;
- development of critical thinking skills;
- enhancement of communication skills;
- taking responsibility for one’s learning;
- experimentation with multi-processing in cross-curricular/integrated curriculum contexts;
- creating products which integrate text, graphics, music and animation, in other words, multimedia.

She explains that there is no right way to use *MicroWorlds*. It can be used successfully in a variety of contexts and every teacher and group of students will find ways that suit particular contexts and particular needs.

Stephanie's first degree was in Art and she firmly believes that students can express themselves visually very well. For example, she has two new students who have recently arrived from Cambodia. One of them has been described as "preliterate" by the ESL teacher but, claims Stephanie, he is having some success with *MicroWorlds*.

When asked about the role of the new technologies in her Grade 4 class, Stephanie explains that they have a "fairly focused role. They carry children's ideas." She likes *MicroWorlds* because it allows students to put their ideas into motion as well as just being static if that's what is desired. Multimedia she believes "puts ideas into motion". It draws on the students' visual principles. It elicits speech and talk. It encourages an "embryonic understanding of music". It also involves more traditional activities such as writing, but with the button-activated element, it also involves new literacies. She likes the aspect that elements are hidden—people have to go and look for them. Students really relate to creating things that adults have to go and look for. But she thinks that the button links also appeal to adults.

For Stephanie, multimedia involves diverse types of literacy. It's not just reading and writing, it goes beyond. Literacy really becomes "communication" in the form of multimedia. Stephanie regards her Art and Design background as important, particularly in the multicultural environment of New Park. The students don't always have strength in their second language which is English. Stephanie says that she knows that they have all these good ideas inside them "busting to get out" so she gives them as many vehicles as possible to express these ideas.

Like many teachers these days, she anticipates an increasingly technologised world so that she argues that it's important to provide students with opportunities to become familiar with the new technologies. She predicts a new generation which is at home with the technologies, unlike many of the ageing teachers who populate schools at present.

Yet she is sympathetic to the teachers who continue to use the technologies in minimal ways. She observes that the less experience teachers have, the less likely they are to use a technology such as multimedia in their classes. When asked what would happen if she and Chris left the school, she said she guessed that people would just "muddle along" till the principal, who is committed to the central role of technology, appointed replacements. And this is exactly what happened. Stephanie successfully applied for a new position, a promotion. This left New Park with only one "computer-head". Stephanie was central to the success of her multimedia program with the Grade 4 class. Even though individuals are not irreplaceable, the sudden departure of a key figure poignantly demonstrates the fragility of the technology arrangements in so many schools.

Stephanie is committed to keeping up with the new developments and intends to incorporate each new development into her teaching practice. There is no fear; just a

desire to use the ever increasing powers of the technologies. She feels confident about her own ability and competence with the technology but still feels there is much she could learn. Stephanie runs professional development courses for teachers at her school but also for teachers in other schools. Although she believes that technical support for teachers is important, she also thinks that teachers should have minimum competencies so that they are not dependent. One factor that constrains her at New Park is the fact that her classroom is a portable without good security, so she has to go to the computer room rather than have laptops in her own room. She would love more powerful technology but the school cannot afford it. She talks somewhat wistfully of the well endowed private schools with unlimited access—her dream, but unlikely to ever be the reality at New Park.

Stephanie believes that the students could learn more but what they achieve is limited as they are with her for only one year. It's unlikely that they'll have many more opportunities to use multimedia in such detailed contexts when they go up into the next class. She suggests that teachers often progress along a sort of trajectory. They begin by maintaining tight control of the students' learning but then move more into the role of facilitator. But Stephanie is dubious of the all too common attitude: "The kids know more than us, so let's just give them free rein." She wants to build on her own knowledge, but she also wants to make sure that the students are continually challenged and growing in their access to knowledge.

She looks forward to the day when the school is connected to the Internet with sufficient access for the students to talk to other students: she sees that as potentially really powerful learning. Technologies such as video conferencing and email, she thinks, are very important in developing students' interpersonal skills. Stephanie is very keen to take advantage of the opportunities for collaborative learning possible through the connections between schools and groups of students. At this stage, the school has only one modem link to the Internet.

As she is responsible for her own class, she has very limited time to work with the teachers in school to help them develop skills and confidence. She is dismayed at the ways in which the CD-ROMs are used: the students are often observed playing and filling in time. She sees this as unfocused teaching without purpose and direction and of restricted value for the students. There's the entertainment aspect but, according to Stephanie, that's not what education should be about. She believes the products can be used more meaningfully. Teachers should be working within curriculum frameworks and with guidelines. The students have to achieve certain outcomes and the teachers aren't looking closely enough at the different software and its potential. But on the other hand, she wants to meet the needs of her individual students as well as the outcomes prescribed in the Curriculum and Standards Frameworks (Board of Studies, Vic., 1995a & 1995b).

When working with the students on their writing for the multimedia products, she says that she emphasises small amounts of writing rather than screen after screen so that the students are concentrating on making meaning in manageable chunks. She uses the West Australian "First Steps" (WAFS) program as a theoretical framework for the literacy work she does with her students. In fact, WAFS is the English curriculum platform used at all grade levels.

In the sessions with her Grade 4 class, Stephanie aims to help students understand what a text is and how they can have control over it. She plays around with texts—shortening sentences, re-arranging words, adding more words. She uses the board to demonstrate these possibilities. She has an Apple 11e in her classroom and the students use it to write stories, but, of course, with 19 students and one computer, the students have minimal contact.

As the students have access to the computers only once a week, they are compelled to craft their stories before they come in, even though Stephanie would prefer them to write directly to the screen. They plan the title, introduction to the characters and setting, the body of the story, then three possible endings. Some include plans for links all the way along; others wait till near the end to set up the buttons to the alternative endings.

Despite Stephanie's belief that the students are profoundly influenced by the visual media with which they are surrounded, when they produce these stories, the emphasis is still on the text and the visual are included mainly to enhance the text. The students work in pairs and also move around the room from time to time to look at what others are doing. Two children begin by opening their last creation—a presentation on the Olympics. Apparently they begin each lesson this way, displaying immense pride in what they have previously achieved.

As 90 percent of the students are from non-English speaking backgrounds, paired work seems a sound choice by Stephanie. Two students are producing sound for their story. They are clearly enjoying themselves, redoing what they have already done to achieve a better recording.

The students began creating their stories at the start of term. They have been asked to devise at least three alternative endings. They are also asked to include text in this project. They construct the text themselves, then peer conference, then Stephanie has a look, mainly, it seems for proofing. Stephanie emphasises the learning involved in this project. She argues that different kinds of learning are involved. She teaches both with and without the computers and believes that time without the computers can also be productive.

In her class there is an emphasis on learning and problem-solving. She feels it is a better approach than worksheets which are commonly used by many of the teachers at New Park. The students are engaged. Stephanie describes the students as a television generation. She gives the example of one pair of boys who are recreating "Avenger Penguins". She argues that they work out how to reproduce the graphics and colour and then make their own versions of the story. Stephanie believes this is entirely appropriate for this generation of students. They are surrounded by technology and in her class "make the technology work for them" as it does on TV.

Stephanie uses the word "authoring" in a very interesting way. *MicroWorlds* is an authoring program but she applies it also to the students' writing. She has a somewhat expanded view of what writing is in the context of *MicroWorlds*. There is more to the writing than just inputting text. She is a little critical of other teachers who

have students transcribing stories, in essence using the computer as a fancy typewriter. She says that one motivation of these teachers is for their students to acquire keyboard skills but she believes that this is a limited view of the potential of the computers. Although she doesn't use the term, she has a strong sense of "multiple literacies" in the age of technology.

She also believes that the work with *MicroWorlds* takes the students further with their literacy skills than in previous years. There is a very positive atmosphere in her class: it is open, the learning is focused, the students are all on task and there is also a lot of peer teaching. Stephanie is committed to the students' ongoing use of *MicroWorlds* so that they can reach the stage when they can produce complex products.

Stephanie is ambitious—she is applying for other jobs and would like to get into a Navigator school—one of the few schools in Victoria designated for intensive investment in technology. And, as reported earlier, she was successful, but not a Navigator school. She has been employed to take a leadership role in another suburban primary school where she will again be responsible for building a culture that will include the purposeful use of educational computer applications. A factor in her desire to move was that she was very much an island in this school. She said that it was difficult to persuade other teachers to learn something such as *MicroWorlds* because they felt it was too difficult. At staff meetings, when she raised the issue of teachers setting students up to play games with the computers—what she regards as timewasting—she was met with the response: "Computers are your thing, Stephanie. We have other interests." The principal believes that this response is no longer representative of staff opinion.

The students in Stephanie's class will proceed next year into Grade 5 after having acquired a lot of skills in Grade 4. In Grade 5, they will probably be invited to play games when scheduled in the computer room or perhaps to transcribe stories. It is unlikely that they will experience the intensive, committed focus that provided opportunities for growth and extension of their electronically mediated literacies.

Stephanie interacts with Louise who has apparently developed her ghost story quite independently, even though the rest of the students in the room are working collaboratively in pairs. As Stephanie looks at the screen, she comments how much the student has achieved but also suggests ways in which she can go further. She offers her assistance if the student wants it. Stephanie displays deep pride in what the students have achieved independently of her. The quality of the texts is quite remarkable considering that the students are in Grade 4 with different language backgrounds. Many are writing fluently and imaginatively.

The students are in the computer room for one and a half hours per week and are remarkably engaged in what they are doing. Stephanie is a totally confident user of technology. She does not rely on the Computer teacher who is sitting in a corner of the room. She makes suggestions to students as to how they could take things further then proceeds to show them how if necessary.

Her Art and Design background is an interesting factor. She takes a different perspective on multimedia texts to English teachers. She argues that the design of

the screen is an important literacy for the students to acquire. Five minutes before the bell she tells the students to finish what they're doing: "Finish the procedure you are doing, the text you're writing, then save".

### *Lesson one*

Stephanie begins the lesson by reminding the students of the principal things she wants them to achieve and to keep in mind. They listen attentively but it was clear they were keen to get on with their stories.

Her instructions were:

- work with a peer;
- check the text - see if it makes sense and then proof it;
- check that the procedures are correct.

When the students complete their projects, she does a "show" using the TV screen to project the work. She observes that they are more concerned to get their work correct and looking good because the computer is more public and they are creating a product.

Again, there is an amazing degree of engagement in the room. The students read each other's work and do so with interest, attention and enjoyment. Stephanie moves around but she resists superficial comments. She engages with the stories on the screen and helps the students to improve them so that they "make sense". She roams the room as a troubleshooter, an energiser, a consultant.

In justification of her decision to stay with *MicroWorlds* rather than to use HTML software, Stephanie laments that the shift will involve the loss of the integrated learning available in *MicroWorlds*: language, maths, visual literacy, more skills and most of all problem-solving activities. As the students usually work in pairs, negotiation is usually involved.

### *Lesson two*

This lesson has all the ingredients of good learning: collaboration, work-focused, problem-solving talk, enjoyment, engagement, clear goals, sense of satisfaction and achievement amongst the students.

One group of four boys speak in Cambodian. Stephanie asks the students to save what they're working on and then talks to them briefly about their views of working with multimedia. She talks to them about their multiple endings. She tells them that they have to think about what's going to happen. When she asked them whether the story writing would be as good without computers, one student replies that she likes things that move, that it looks real like real-life. Louise says that it's better than a story book: things can move and the pictures can show what's in the story as well.

When asked about the voices, one student answered: "I like to hear myself telling stories." Kong says that he can do ABC News. When asked further about sound



effects, Stephanie is told that good sound effects match the story. When Lee is asked what she likes best, she replies: "I like typing into the computer. You don't need lines and it all looks the same."

Tony tells me that he thinks it very important that they are using computers in class as they are important for jobs and if you want to be a computer person, it could help. He also said that he'd like to use the computers more and if it was possible to have his own portable computer to use all the time. He likes using *MicroWorlds* as it allows him to invent games like the ones he uses in games parlours.

### **5. Distinctive features of the practice**

At first glance, it may seem that the focus of this case is somewhat limited: one Grade 4 teacher achieving wonderful things using multimedia technology with a group of motivated students for whom English is not their first language. But a number of factors help explain her success and the identification of these factors may be salutary for teachers working in other sites who may be faced by some of the same challenges.

One factor that makes Stephanie's approach noteworthy is her deep understanding of the potential of the use of multimedia for students' learning. For Stephanie, multimedia has endless possibilities for her students. For these students, who have limited English language skills, it offers a medium in which they can express themselves in multiple ways. As she puts it, their creativity is "busting to get out". Stephanie provides them with opportunities to let that creativity take finite form, to be totally engaged in the process of making the stories and, at the end, immensely proud of the products.

Another factor is the active role she assumes within the professional association. Further, she has undertaken higher degree work in the field of the application of the new technologies to language and literacy education. Stephanie believes that her commitment to her own ongoing professional development is central to the work she does with her students.

### **6. Issues and implications**

The *fragility* of effective technology-based programs has been a recurring topic of discussion amongst the research team. By fragility we mean the vulnerability of technology initiatives: vulnerability to withdrawal of funding, the departure of key players, a shift in institutional attention to another priority area for investment and development. We have talked about fragility's multiple dimensions and manifestations. The story of Stephanie's Grade 4 class, her significant achievements in the area of multimedia with a group of students in a school, with not inadequate resources, but limited teacher expertise, and the virtual collapse of the multimedia program when she left for another job, exemplifies our notion of fragility.

The continued use of technology for literacy purposes at New Park is susceptible to disarray, even dismantlement, because it has been dependent on two “technology stars” who initiated and nurtured the initiatives. The rest of the teachers are less skilled, not as confident and less motivated to explore the possible uses of the technologies in their own classes. This is an important issue, not just at New Park but at many other sites, that needs to be recognised and action taken to resolve it.

This scenario is not unique to New Park, hence its inclusion in this study. It is tempting to make a comparison with Ealing Grammar and the ways in which that school has ensured that technology is not person-dependent—that it is a cross-curriculum initiative involving all members of staff. The comparison might suggest ways in which New Park could attempt to involve all teachers in the uptake of technology for literacy purposes. But such a comparison is problematic for a number of reasons. The main reason, to put it bluntly, is that one school can instigate reforms knowing that it can continue to fund them, while the other has extremely limited resources and therefore far fewer options (Secada, 1989). Implicated in this case study are issues of social justice, a notion without much political currency in these economic-rationalist times, but perhaps one that we need to foreground if we wish to provide all Australian children with equal access to these new technologies which are increasingly dominating the cultural and economic landscape. It is becoming almost a cliché to point out that with the advent of the new technologies, the differences between the haves and havenots are more extreme, that issues of access and equity must be addressed by governments or else we will find that we have a society divided into two main groups: the wired and the rest (Selfe & Selfe, 1994). I have heard the second group, the vast majority, referred to as “the tired”, an evocative reference to the deep inequities in our society.



## **NEW TECHNOLOGIES, OLD TIMETABLES: THE DIFFICULTIES OF EMBEDDING COMPUTER USE ACROSS THE HIGH SCHOOL CURRICULUM**

### **1. *The study at a glance***

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. Nonetheless the integration of computer technology into teaching and learning across the whole school curriculum is not an easy task and the school constantly debates the issues involved, recognising that some basic assumptions about “school” will soon need to be tackled.

The school has also been willing to explore the relationship between technology and literacy with one member of the teaching staff (the Support Teacher Learning Difficulties (STLD)) awarded a year’s leave on full pay to research the benefits of computers to secondary school students with learning difficulties.

The STLD works closely with Alison who teaches English. Alison refers to herself as one of the computer generation and reckons that she couldn’t work without her own machine at home for lesson preparation. Her classes (Years 8-11) 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.

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.

### **2. *The site***

The school is a 5 year old technology high school built in Sydney’s northern suburbs to cater for 800-850 students and now housing over 1200. Portable classrooms take up a considerable portion of the recreational space. The school was originally equipped with limited computer technology through a partnership arrangement with IBM and Lotus. Since opening the school has bought out the leased computers and purchased many more through school and community funds. However the relationship continues. Four students from Year 11 as part of a scheme known as the E-team scheme each year spend a week working with IBM staff on a specific problem, making a presentation to management at the end of their week. The school was also the first school in Australia to be approved by Bentley Software Company as a school

of excellence. This resulted in the school being granted a copyright licence worth \$500 000.

The campus adjoins the school's major feeder primary school behind which is the high school's playing field. The school, which was the first purpose built Technology High School in NSW, is in the middle of a growing, middle class area, with large scale housing development. Approximately 36% of the local community is from non-English speaking background with the majority language groups being Cantonese and Mandarin. There are 48 language backgrounds represented at the school.

The school prides itself on being a place where students from different backgrounds can come together as one. According to the P&C newsletter the school is well respected in the community where it is recognised that students are encouraged to excel in many diverse areas. For example in 1996 five students had their work in animation and design showcased at the Powerhouse Museum, Sydney. The Creative Arts teacher who specialises in computer graphics and animation previously worked for Disney.

The large common staffroom is well equipped with computers for staff use (an average of 2 per faculty) and next year will have one machine per faculty and Internet access. There are 4 Notebooks available for teacher use. All student reports are "done on computer" and all records, rolls and timetables are computerised so that any student can be traced at any time. This system is secure from unauthorised access. The library has 2 Internet terminals and 5-6 CDROM players for student and teacher access. Students have access to 10 Laptop computers.

### **3. The policy context**

Recently teachers were asked to consider the following questions when planning for technology: What are the educational purposes of using technology in our school? Whose educational interests are/are not being served by technology? What are the learning needs of those within our school learning community? These questions arose from a concern that the use of computer technology was not being uniformly integrated across the curriculum (see student comments below).

According to goal 2 of the school's strategic plan 1994-1998 the school aims to 'provide a comprehensive curriculum which embraces technology in theme and delivery'. This includes meeting student needs through learning structures and programs, enhancing current student reporting practices and integrating technology into the curriculum. In revisiting this goal teachers also addressed the following questions: Are we a Technology High School (developing skills to work in teams and to solve problems creatively using a range of technology across the curriculum) or are we a Computers High School? Can the "average" teacher get more out of the technology in the school? The ensuing debate was a factor in the school's decision to reorganise computer resources to give students and teachers greater access.

The school was built with three labs equipped with 386 PCs and a media editing suite. Separate music, animation and robotics and additional CAD facilities have since been

equipped with scanning facilities and other improved technology. However other classrooms are increasingly being given access by equipping small withdrawal rooms, situated between classrooms, with Internet access and 6-8 machines each. Alison will have access to one of these rooms in 1997. Throughout 1996 her choice had been to book a class set of laptop computers or else to negotiate access to a computer lab where computer technology related courses have priority. However negotiating access was not considered a difficulty. Alison's feeling is that there is a great deal of encouragement for teachers to use computers and related technology, "Something is always available, or someone is always willing to negotiate access".

Curriculum and technology committees ultimately make resourcing decisions about technology but report back to staff meetings. All committees have budgets negotiated with the principal.

Teachers help each other willingly and create opportunities both during and out of school time to extend their own and colleagues' skills. Whenever a new piece of computer equipment is bought someone on staff runs a "forum" (an inservice held periodically out of school hours). Says Alison, "this school is so supportive and encouraging, someone is always there to help you". Some teachers also organised after school computer sessions for students in their subject areas (eg., CAD).

According to a recent survey conducted by one of the Computing Studies teachers over 85% of the school's students have computers at home and over 35% have access to the Internet. Younger students were more likely to have access to the Internet than older students.

Students studying computer technology courses (with priority use of the computer labs) are predominantly male although more female students are choosing these subjects for 1997. One of the duties of the technology classes is to take responsibility for the upkeep of the school's computers including minor repairs. All Year 7 students are introduced to computer graphics and animation, which are taken up again later as part of the Year 10 Creative Arts syllabus. Year 7 English students participate in an Introduction to Mass Media course which includes a section on the Internet.

### *Literacy*

The Support Teacher gives all Year 7 students the Torch Test (a reading comprehension test from WA based on the cloze strategy). Four years ago students identified by the primary school as having reading difficulties were given practice in sight words and phonemic awareness. When this had little effect teachers "realised it was a comprehension problem" and used an SRA kit instead. Students moved from this to using computers to improve comprehension through games, adventure software and simulations (e.g., *SIM City*). This project constituted the STLD teacher's preliminary research for a Masters degree for which she was later granted 12 months paid leave. She found that students in this program were "on task" almost 100% of the time and reading improved considerably. The program stopped when the research stopped but will be reintroduced in 1997.

This willingness of students to engage in computer mediated school learning activities could have something to do with the nature of human-machine communication. If, as Reeves and Nass (1996) say, human responses to media are determined by the very rules that apply to social relationships and navigating the world and that people relate to computers in much the same way as they relate to other people then computer technology has a voice in the discourse of the classroom. However the penalties for students misreading this voice are far different from those of misreading other classroom (person to person) communications and if things get bad you can always switch off!

According to Maturana and Varela (1987) communication is the “braiding together of languaging and emotioning”. However in the case of the computer the student does not have to read a complex emotional text along with the on screen language of written, visual and spoken texts. In any inter-person communication the emotional text entwined in the language is often far more difficult to read and often has a resonance and consequences long after the conversation is over. However after the computer is switched off the student does not have to fret about whether the computer (teacher) still likes her or him. Reading the emotional flow of communication is a vital part of learning and where groups work together at a computer they will have opportunity to develop this awareness in a network of peer relationships. However the emotional component of communication in the particular power relationship of teacher and student (which is much easier for some to read than for others) is temporarily suspended in the student/computer environment leaving space to concentrate on other things. This could be one of any number of factors contributing to the success of this and similar literacy/computer programs and deserves further investigation if only because of the large number of such reported improvements in students’ reading.

The school itself is keen to conduct further investigation and has created an Advanced Skills Teacher position for literacy. The school is currently participating in a transition literacy (Yr 5-Yr 8) project in conjunction with the neighbouring primary school and a local University. Alison is coordinating the project. The high school students will become mentors to primary school students, samples of work will be exchanged, classroom observations will take place and common strategies explored. A paper on the findings will be presented at a state conference in May, 1997.

The school will participate in the trial of a diagnostic English language and literacy test for Year 7 students in 1997 (the English Language and Literacy Assessment (ELLA) test).

A school Development Day held in November, 1996 focused on literacy across the Key Learning Areas using National Professional Development Program (NPDP) genre-based literacy materials developed at State level. In discussion the issue of the use of traditional reading skills in a hypertext environment was addressed.

The school has recently set up 2 advanced classes (1 in each of Year 7 and Year 8) for English, Mathematics, Science and Human Society and its Environment. Admission into these classes is based on teacher recommendation and assessment results. However the classes include some students with behaviour difficulties, 2

vision impaired students and a number of “under achievers”. There are advanced English classes in Yr 9-10 and a boys only class in each of Years 9 and 10. The rest of the school is organised into mixed ability classes for all subjects.

#### **4. The practice**

Alison’s home room was originally intended as a Science lab and so has a lino floor covering and large bench with sink and bunsen burner taps in front of the blackboard. Student desks are arranged in 7 blocks of four which accommodate 30 students. The room appears overcrowded and cramped. The lino floor covering means that the sound of furniture and student movements is accentuated. The ceiling is perforated and corrugated and gives the room the feel of a factory produced “box”. It opens onto an outdoor walkway and the school’s grassed recreation area.

Alison is in her third year of teaching English. She sees her role as helping kids to develop their own skills in literacy, reading, writing and media. She considers herself to be one of the computer generation. She uses computers everyday for all preparation and marking and can’t envisage doing these tasks without the benefits of a computer, “As a computer child I can’t write,” she says, “handwriting and spelling are being taken over. I’ve grown up with this and can’t read my own writing.”

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, “Even when they don’t have a sophisticated level of computing skills they pick it up really quickly. Even if they have other [learning] difficulties they pick up technology very fast.” 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 CDROMs (e.g., *Grolier’s*) where information is usually presented for an adult audience.

Alison says that, she “is willing to incorporate anything new as long as students are still learning and that it’s not just a game or time filler . . . Kids are given chances here that people in industry don’t even get.” She is referring particularly to the work of the former Disney employee now a member of staff. “We are preparing students for the outside world but actually using real world applications everyday,” says Alison. In the future Alison would like to use CAD to design sets for drama. Currently she is using word processing for the writing of play scripts to be performed in front of the class.



2.25 p.m., Yr 8 students working in their classroom in groups of 4-5 with an IBM lap top with external disk drive to each group. They are **writing 5 minute plays to be performed** in front of the class. A group of boys argues over who will type. One reluctantly agrees, and two others dictate the dialogue, the other 2 students are designing costumes.

In a group of 3 girls and 2 boys 2 girls are typing, the 2 boys take the computer turning it round to face them, "that's good. Right, after we've fallen off the chair what shall we do?" The boys type while the girls draw the characters on a large sheet of paper. All group members discuss the development of the plot as they type or draw: girl "I need a word for eat", boy "masticate", girl looks it up in the dictionary. A girl moves around the table to where the boys are typing, she adds to the text. A few minutes later she takes over the typing turning the screen around away from the 2 boys, one of the boys turns the screen back a little to watch.

A group of 6 girls sits around another table. Three girls at one side are making red cross arm bands, 2 girls are typing with another standing behind the typers dictating from a paper, occasionally adding extra lines.

2 55 p.m. "Start saving please, pack up the machines." The machines are packed away into their bags, one person from each group takes them back to the library. "Chairs on tables, you may go."

The distribution and packing up of machines was a familiar routine to these students who performed it with minimum fuss. Nevertheless there is an inevitable loss of time involved, particularly so if this were to be repeated in several 40 minute periods in the day. Access to and use of computers for Alison's students is bounded by both the school routine of timetable and classroom and resource allocation/distribution, and the lesson routine which structures the way in which computers are used (or not used) each period. Both of these layers of control together define how computer technology is used in student learning. Inevitably decisions such as when to use the computer (i.e., when is it appropriate or desirable) for what purpose, for how long and with whom are in the hands of teacher and school. Compare this for example with the decisions to be made by students in the primary school classrooms described in the previous Sydney site studies where students are able to make many of these important decisions for themselves. Alison's high school students understood these limitations; they did not question the need for timetable, bells, classrooms etc. Most had access to computers at home which allowed them time to explore and experiment. Nevertheless the principal and many of the staff are aware that use of computer technology cannot be an integral part of student learning without examining the underlying assumptions of high school life. Hence the questions posed to staff at the school development day (above) and the school's interest in the work of, for example, Gerry Smith at Riveroakes, Canada and David Dwyer's (1995) report of advances in student learning outcomes in Columbus, Ohio.

The 7 students interviewed (from Years 11, 10 and 8) were confident users of computer technology. All had computers at home and all agreed that they had plenty of opportunities to use computers and related technology before and after school and throughout the day (although they didn't usually take up these opportunities preferring

to use their own machines at home). Internet access was limited but bookable. The Years 8 and 10 students interviewed had Internet access at home but not the Year 11 students. On a show of hands 2 of a class of 22 Year 11 students had access to the Internet at home.

Alison believes that her students' use of computers is making them more aware of presentation aspects of their work. She is passionate about students taking pride in their work and refers to the student assignments on her classroom walls with great satisfaction. Often they draft work at school and type up at home. Alison believes that computer technology helps her cater for a wide range of ability and language backgrounds. "All kids can type at the same rate," she says, "and spell checkers are for everyone."

10.00 a.m., Yr 7 They are working on their newspapers after an interruption of several weeks because of debating.

Alison: I've printed all your newspapers out just to remind you where you're up to. The disk is here, you need to go into Windows first then into Ami.

Three girls stay round the tables the rest move to the computers 2 or 3 to a machine. Four boys sit together and one calls out

B1: How do we get into it?

B2: Open, open.

Alison: This is a big group why don't some of you write some new articles to go in while you other two type.

B2: Yeah, we could write about the debate on the dance party.

Three girls are using Ami Pro which allows them to make columns. They point out where in the menu they find pictures to illustrate the written text. They explain that drafts are first written in their English books. The assignment is to make a 4 page newspaper based around stories associated with the school. The project will take 2-3 weeks.

The girls "get all the stuff down first then they use the spell checker" before they print. Two people write the stories and two type in and edit as they go "we type what we have written out".

At the end of the lesson the teacher takes a disk from group to group onto which all students save their work. Students are instructed to close down and "go out through Windows". "All computers closed down properly? Turn your mouses over [this is to check that noone has taken a mouse ball], stand behind your chairs, (the lights go out to signal the end of the lesson) forward out."

Although Alison was enthusiastic about the school's use of computer technology and the cooperation of all staff in sharing the resources, she would have liked to have been able to use computers for extended periods of time, without the interruption of period changes.

The Year 11 students were not using computers as much as they previously had because of the HSC. One parent had restricted use of the home computer to weekends. As one student said “this year we don’t have as much time to muck around”. Both said essay writing was now the primary use (unless you were doing Computer Studies). But this was for final draft only because “you can cross out on paper and still see what was underneath in case you change your mind”. (Year 8 students also reported editing on paper first but for different reasons—they edit before they type because time on the computer is limited and if they are too slow they might have to wait until they are back in the computer room before they can print out. However Year 11 were referring to their own study time whereas the Year 8 students were referring to a class activity.)

One Year 11 student talked about the importance of computers in learning. “It depends what subject—it’s more important in Computer Studies than cooking. In Computer Studies it’s of great use. We are studying integrated circuits. Someone’s designed a simulation program that lets you learn about them. It lets you fiddle around because you can learn more when you fiddle around and try different circuits and see what happens. Computer Studies is the only subject where learning is on the computer but I use it in other subjects such as English, History, General Studies but not Maths.”

By way of contrast one Year 10 student had been at the school 4 years and guessed he had only used a computer in approximately 16 periods (he was a confident user of computers and used the Internet extensively at home to explore music sites). He believed this was usual among his friends. He had used computers once or twice in English (and liked this because it retained the novelty value) and in Textiles in Year 8, he had been in the computer rooms for 1 or 2 periods in Year 7 as the different subjects were being introduced. He was not currently using them in most of his subjects (Music, Visual Arts, Science, Maths, Geography). Another Year 11 student explained his pattern of use, “Last year I used them more than this year. They showed us part of the Internet and we had a multilingual word processor. But this year we’re always on a time limit we don’t have the time to go out of class and muck around so I only use it for essay writing. But in the case of Computer Studies that’s what it’s all about so we use them all the time”. On the other hand a Year 10 girl said she used computers about 75% of the time particularly in English (for word processing) Maths (CAD) Human Society in its Environment (HSIE) (word processing, CD-ROM & Internet) Science (word processing, CD-ROM & Internet) and Technology and Applied Studies (robotic arm). The Year 8 students reported use in English, Maths (problem solving) and HSIE; they had also participated in the statewide Streamwatch program which links schools together via email to share data on the health of local stream and river systems.

All students interviewed agreed that computer use depended on what subjects you chose and what teachers you got, so it was possible to not use them at all in some years. Nevertheless students agreed that their teachers could book the computer lab, the lap tops and the school’s Internet machine and were content with the level of computer access provided by the school.

These students were acutely aware of the competitive edge that knowledge of computer technology might provide in job seeking. As one 14 year old said, “When you leave school if you don’t use computers it will be a disadvantage, you’ll be behind. Other people will get the job.” While recognising the importance of computer and information technology to the world of work the students were concerned about some of the implications of increasing computer technologisation for society. For example one of the Year 11 students pointed out that the Internet “could make life a lot more hectic, as new tools are invented in history people have worked faster and harder, but the human ability to cope with more work does not equal the human ability to cope with this in speed terms—for example take speech recognition, it would write what you say faster than you can think what to say”.

Their conversation ranged over most of the major issues discussed at length by the media and by writers like Birkerts (1994) and Postman (1990). The students talked of: a possible reduction in privacy (with increasing use of huge data bases to store personal details); a reduction in health and well being (people would become lazy using the Internet instead of libraries or galleries, and people would become isolated because of home entertainment, home education, home business); job loss (computers replacing people); inequality (those without computers will become the unemployed, there will be information rich and information poor); access to unsuitable material (there needs to be restrictions similar to those applying to other media); keeping up with the speed of change (information anxiety).

On the positive side students recognised the part played by computer and information technology in relieving people of some of the more tedious or dangerous kinds of work. They recognised the benefits in increased knowledge for example concerning disease or the environment.

All the students interviewed saw computer technology as an integral part of their lives and an increasing part of the future, especially the Internet with its potential for supporting online communities. Consequently they were keen to learn more and to use a range of technologies. Most learned from teachers and friends and from “fiddling around”. As one Year 11 said, “I’d prefer to learn from a specialist teacher or course but otherwise I would prefer to learn from fiddling around because you can choose to learn what you like.” This student also commented that although they used computers for essay writing in Years 11 and 12 they had to write by hand for the Higher School Certificate exams, which seemed unfair when they had become used to the benefits of the technology (especially for handwriting and spelling) and could type faster than they could write.

### **5. Distinguishing features of the practice**

One of the distinguishing features of this site was the active support of the principal and the mutual support of colleagues in pursuing new technologies and new ways of using them for the benefit of student learning. This was evident in practical ways such as willingness to negotiate access to computers, willingness to demonstrate new hardware and software and an informal and professional interest in each other’s work.

It was also evident in the whole school interest in debating the bigger agenda of what makes a Technology High School (e.g., developing skills to work in teams and to solve problems creatively using a range of technology across the curriculum), and what kind of changes this requires to whole school organisation. (Since completing this site study some of the school's computers have been relocated from labs into small withdrawal rooms between pairs of classrooms giving easy access during lesson time for ongoing and incidental use. In addition part of the school library has been converted into a learning centre with 20 computers networked to the Internet and plans are in place to bring the Internet to all classrooms by the end of the year. Email links have been made with schools in France and Germany as part of the school's languages program.)

A distinguishing feature of Alison's classroom was the way learning was scaffolded for students. Every unit of work was clearly outlined so that students knew where each lesson fitted into the whole. Students were 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 checked that students understood details such as the meaning of words and phrases. She expertly built on student knowledge by eliciting what they already knew and with them deciding what they needed to find out in order to complete assigned work. The purposeful use of computer technology was a part of most unit plans. These units or work were well documented for easy sharing with colleagues.

## **SPUR PRIMARY SCHOOL: MELDING THE OLD WITH THE NEW**

### **1. *The study at a glance***

Five teachers and the principal of this large rural primary school discuss 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.

The school is set in a rich agricultural region of NSW drawing its students from the local farming population (both property owners and farm workers). 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 having won the Director-General's award for Excellence in Literacy in 1996. 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.

As these teachers speak of their work the enormous challenge confronting teachers as they try to integrate computer technology into their teaching becomes apparent.

### **2. *The region***

Spur Primary School is at the hub of one of the richest agricultural regions in Australia. Its fertile black soils produce abundant cereal crops, including wheat, oats, barley and sorghum, and a variety of oil seeds like canola, safflower and sunflowers. As well, Spur leads the country's cotton growing industry, producing two thirds of the nation's output.

Though less well known, the region also has a flourishing pecan industry. Some 35 kms to the east of the township, one pecan nut farm produces 95% of the Australian crop and is the largest orchard in the Southern Hemisphere.

Perched at the junction of two of the nation's major inland highways, Spur's population of 10,500 people enjoy ready access to Australia's major arterial routes.

The Centre of Agriculture and Regional Economics in Armidale expects gross outputs for this region to almost double in the period 1993-1997, from \$1 billion to around \$1.7 billion. Agricultural production alone is likely to reach \$675 million which may require up to an additional 1300 extra jobs for the area.

### 3. The site

#### The Teachers

Ken is the principal of Spur Primary School.

Kay has been teaching for over five years and currently cares for a Year 3-6 composite class.

Carol is teaching the Year 5/6 Gifted and Talented class that is selected by a combination of parent and teacher nomination, taking into account gender and race considerations. (There are 14/60 nominations for the G&T class from Year 4 for next year, two of whom are Indigenous Australian children.)

Jill is a Year 5/6 composite class teacher (there are three others).

Jenny is the school's Computer Specialist whose role it is to take all classes and expose them to a variety of computer skills. She is also responsible for maintaining school awareness of new technologies and conducting in-servicing for other staff. In addition to acting as the school technician, she provides technical support for other schools in the area. She has been teaching for two years.

Carmen is a Year 4 teacher in her first year of teaching.

In the heart of Spur itself, Spur Primary School (SPS) has a school population of some 450 children; half of whom are of Indigenous descent. Children attending SPS come from a wide range of socio economic backgrounds. While Spur is a rural town, and, as previously described, a fairly wealthy one, the school's policy is quite specific about providing equal opportunities for all students, regardless of race, religion, wealth, ethnicity or gender.

SPS is well and truly committed to pursuing the advantages that technology can provide. Staff at SPS have access to 3 computers outside their own classrooms; a Mac 6100 in the Staffroom and two laptop 190s that are available for borrowing. Students are able to access the Internet via the Library computer and there are another five computers located there for the purposes of gathering information for projects, etc. Six Mac Classic computers are located in individual classrooms and the Computer room contains another 32 computers.

Teachers describe the degree of access for both students and staff as being quite good. Kay claims that it is the best she has seen in her experience thus far. She herself does not find the technology confronting because she had her own Mac computer at the University of New England (UNE) and she used this for her lesson preparation. "The technology is always accessible, the kids know all about it, and gender or race usage differences are not apparent," she says. Others are more circumspect in their praise, believing that more computers are needed in each

classroom and that there needs to be more time for each class in the laboratory over the week.

Jenny, the computer specialist teacher agrees, though she points out that everyone has access to the library and that the computer room itself is timetabled to be free at certain times for access by any class. Outside of allotted time, the Gifted and Talented class has been located close to the computer room so it can use the facility as a type of "personal lab". It would appear that representatives of all cultures and both genders have equal access to technology on this campus. In spite of this, Jill says that there are still students at SPS who are resistant to the use of computers but that they tend to have a record of poor attendance at the school.

The decision to set up a school computer room in a disused storeroom space was a school one. In 1995, \$25,000 was set aside for release time and the following year another \$25,000 was devoted to purchasing computer hardware.

The school's purchasing program had actually commenced in 1992 when eight Macs were linked via digicard. The school benefited from the Coles supermarket promotion, "Coles for Macs", and over a three year period received some \$10,000 per annum from the scheme.

In 1993, twelve Mac Classic IIs (colour) were bought, and more purchased in 1994, along with some new LCs. In 1996, fourteen Mac Performas with CD-ROM and shared folders were linked to a file server. An Ethernet cable was linked to the Performas as well as the office computer at a cost of some \$70,000.

The eighteen Mac Classic IIs (colour) are run by a Powermac File server and operate on Local Net Talk. The disadvantage of this setup is that users must boot up the Mac IIs before the Performas (See Observation note I). Individual computers take at least 5 minutes to get information up because the system is overloaded. Each child has his/her own folder identified by the individual class teacher's name, and passwords are issued for both teachers and students.

The principal problem facing the administration right now is finding someone to administer the system. Jenny (the current computer teacher) won't be doing it next year and the school needs at least one hour of technology assistance per day.

Over a period of five years, then, SPS has invested over \$200,000 on the new technologies. This has been funded from a number of sources, including the Coles scheme, the P&C, the DSE and ASSPA (Aboriginal Student Support and Parent Awareness Committee) but such concentrated expenditure is now very difficult as some of these funding sources are no longer available.

SPS decided to support a Mac platform only because it already had a couple of machines and the staff believed that the pull down menus on the Macs would make it easier for young users to navigate their way around the desktop.

As far as access to the SPS computer room goes, all classes are assigned minimum time allotments as follows:



Yrs K - 2 have a single 1/2 hour block per week  
Yrs 3 - 4 have a single 1 and 1/2 hour block per week  
Yrs 5 - 6 have a single 1 and 3/4 hour block per week.

This ensures that the computer room is well utilised and that more staff are skilled through this amount of contact, but it does create problems in administering files, systems, etc.

Interestingly, when Kindergarten classes started using the lab, they needed assistance with turning on the machines, inserting disks, etc., but now they are comfortable even using the CD-ROMS without much instruction at all. It seems that home computer ownership is making such basic instruction unnecessary, though it does raise the question of equity. Just what can be assumed about children's out-of-school knowledge and skills in the use of technology in the late 1990s? Of the students interviewed half of them have access to computers at home but at this stage in their schooling there is no noticeable difference in attitudes or skill levels between these two groups.

The computer room itself is an old store room. One of the major cost items was having it converted, painted and made secure by placing iron bars on the windows. Significant cost considerations for the future will be airconditioning the facility and obtaining multiple site software and licences; the hardware itself is likely to account for a relatively small portion of projected costs.

The school is serviced by a computer firm that is based in Tamworth. This is satisfactory in terms of sales, but maintenance issues are made more problematical because of the distance factor.

#### **4. The policy context**

##### *Literacy:*

Over the past five years SPS has spent some \$80,000 on reading materials, including Readers (levelled) and the Reading Recovery program. The school policy is to ensure that the school library does not become a replica of the Town Library. Ken (the principal) says that the school's focus is on its library ". . . becoming both an information resource centre and a teaching resource centre, a place that services learning programs for the entire school".

In considering budget constraints, the library rarely orders one of anything, preferring to buy boxes of materials so that students can be placed on their own individual literacy programs.

Over the next three years, SPS is planning to spend around \$25,000 on literacy resources in the following areas:

1. readers suitable for 8-11 year old readers
2. 40 multiple packs of high quality literature suited for the top age range in the school;
3. Year 2 - big book purchases plus low ability/high interest readers.

A further policy consideration is that all resources considered for purchase by the school *must* have clear indicators that they can support learning in a range of KLAS.

The Library currently houses the satellite link set up by the DSE for the study of Japanese. Currently, all Years 5 and 6 (120 students) are participating in this program.

SPS uses small group work as the basis of its entire school learning program, and the first four weeks of the Kindergarten year are spent in play structures that are designed to get children used to learning in groups.

SPS is the Reading Recovery Training Centre for the Northern Region of its Education Zone. By the end of 1997, there will be ten teachers at the school who are fully trained in the Reading Recovery program, which has as its aim to remedy reading concerns in Year 1 students. Most of this work is done on a one-to-one teaching ratio, so it is highly intensive work but, according to the school, is proving to be successful in supporting reading development in the early years of schooling for students experiencing reading difficulties.

An "outreach program" of the New England Education Diagnostic Service Program (NEEDS CENTRE) is also based at SPS. It is a service for all the district's schools and assists with the specialist diagnosis of specific learning concerns of individual students.

The Aboriginal Education Strategic Initiatives Program (A.E.S.I.P.) that targets schools with high Indigenous Australian populations also has a program in Oral Language running at the school. This program is primarily for Kindergarten students and aims to give them a solid start with the development of their Literacy skills.

First Steps has been adopted as the official K-6 literacy strategy in the school. Initially the administration examined the growth patterns for the school and were persuaded by a teacher from New Zealand that First Steps was ideally suited to SPS's needs. Visiting classrooms it is evident that the program has enthusiastic support from the staff. Group work appears on classroom walls around the school as well as work samples and check charts.

The school's Language Policy gives a brief rationale for the use of the First Steps Resource Package as its underlying foundation. The package comprises four areas:

Reading  
Writing  
Spelling  
Oral Language (Talking and Listening).

While the sample pages that follow are said ". . . not to be entirely prescriptive", they provide ". . . practical and detailed examples of what is expected across classes K-6". All SPS students are to both write and read every day, and publish some writing at least once a week. The aim is to guide all students towards independent reading and writing, and to develop detailed achievement profiles of every student in the school. Ken has a particularly strong commitment to the implementation of this program and has been prepared to make an issue of it in the past when any of his staff have resisted what they felt was undue emphasis. To his credit, it seems to have widespread support in the community and the program has no doubt contributed to a number of recognitions in the form of literacy awards to the school.

*Technology:*

Ken believes that with the adoption of First Steps, that SPS now has its resources and technology and literacy programs linked by a common philosophy. He sees his role as very much a participatory one. He has just completed the First Steps tutor program himself and has become technologically literate enough to feel that he can now ". . . confidently steer the school program in this direction".

The SPS Handbook states that "Computer based technologies can offer students and teachers the opportunities to explore new and powerful ways of learning as well as offering valuable resources to support more traditional teaching/learning approaches". The statement concludes with the assertion that "A structured school computer policy is implemented K/6".

Ken admits that it has taken some four years to get everybody in the school into the computer laboratory, and he is encouraging his staff to commence data entry for the purposes of student reports. Outcomes based report documents will be implemented at SPS by the end of 1997, and the aim is to have all of this data stored on computer.

As far as decision making goes in the area of technology, Jenny says that the principal does the purchasing in consultation with the computer co-ordinator and the school executive and that whatever needs upgrading in terms of hardware and software generally receives equal consideration. Jill, the Year 5/6 composite class teacher, puts the situation in clear focus, "It is an executive decision", she says, "because by and large the staff are not in a position to advise in this area. The computer co-ordinator picks much of the software because she's familiar with it; some individual teachers do make suggestions but less than half of us are computer literate!" As one of the Year 3 students observed, "My teacher still doesn't know how to access information on the Internet".

Nevertheless, these teachers see the current SPS technology policy as enabling for their own professional development. Carol considers the principal's encouragement

as being critical in providing her with opportunities to develop her own technology skills. She acknowledges that school budget decisions are sympathetic to technology and that unlike many teachers known to her, she and her colleagues have genuine access to the informational technologies even on weekends.

Jill also acknowledges the degree of administrative support provided to boost this area, in particular the availability of funding for class release/relief time and the budget planning that is allocated to technology. Carmen appreciates the encouragement she has had to participate in professional development programs and is grateful to both the principal and the computer co-ordinator for continually updating staff about available resources. As a first year teacher, she has appreciated the ways her colleagues discuss these matters in the staff room and of course, the fact that actual access to the technology is so open for staff.

#### **4. Practice**

The teachers who were interviewed were very conscious of the roles that computer technology is playing in preparing their students for life outside of school. They saw the demands of further education as sufficient enough reason for pushing technology at the primary school level. As Carol said, "There is going to be a much greater emphasis in high school and tertiary study on computer assisted learning". Jill added that "It is a priority already, but we need to prepare these children to deal with rapid change". Four of the students themselves mentioned this very point in talking about the importance of computer skills to their future careers.

Each teacher spoke about the incursions of technology into the workplace already, of how Coles' scanners are now part of their students' everyday shopping lives, and that an understanding of technology is needed in all work areas these days.

Some spoke of the widening gap between generations and of the implications this may have for future teachers, that some kids are ". . . more computer literate than their teachers", depending quite often on whether or not there is a computer in the home. Carmen spoke of the strong likelihood that kids will soon be bringing their own computers to school rather than pens and paper. Commenting on this scenario, she says "It will change the whole nature of teaching and also of personalities, ie., kids who spend time with computers are often not good at social interaction". She sees the latter as being not so much a cause/effect relationship, but rather a type of self absorption. Observations of children working in the computer room over the two days would indicate, however, that in line with current research, computer usage at SPS has a very strong and important social dimension (Durrant & Hargreaves, 1995; Durrant & Hargreaves, 1996; Snyder, 1993).

When asked how they thought computers helped with their learning students talked about a mixture of attitudes, processes and products. They felt positive towards computer use because, "they help you to learn and write", "the work looks neater mostly", "it's faster than a pen", and "it's important for me". Students enjoyed doing project work using graphics software and searching for information using the CD-ROM

facilities. The Internet gives them a new dimension to library use for researching topics, to the point where one Year 6 student confided that, "Miss says I depend too much on the computer!".

The student interviewees were familiar with a wide range of software including games, information sources and applications.

The games mentioned included, *Wheel of Fortune* (helps with spelling and general knowledge), *Solitaire* (learning about numbers), action games e.g. *Spectre Challenge* and *Spin Doctor* (for eye/hand coordination), *Carmen Sandiego* (for geography and general knowledge), choose-your-own-adventure games and those designed to develop specific skills like typing. For information, students used *Encarta*, *Groliers* and *San Diego Zoo*. The applications programs mentioned included *Writing Centre*, *Claris Works*, *Kidpix*, *Simpletext* and *Colour Me*.

Without exception each of the students interviewed spoke with confidence and enthusiasm about using technology in their learning and appeared excited about their own skill levels and ability to continue learning independently.

In terms of the development of new literacies, these teachers are conscious of the life skills that they must impart to their students. Kay defined these life skills as including, ". . . numeracy, form filling, and technological literacy". Jill added the ". . . visual—as being the first thing children use, being easier to interpret and faster". Her rationale for including the study of mass media was that it's important for her students to "interpret and not be manipulated by texts".

Carmen includes interpersonal communication in these life skills, claiming that "they are personal and one-on-one literacy skills, and that computer business transactions require language/literacy skills beyond the traditional school emphasis". She quotes the local Indigenous Australian population as an example. "It has stayed put—hasn't had a need for computer fluency, but now the kids are moving away, and they need some understanding of the new ways of life".

Jenny links reading with understanding and enjoyment. "Students should be able to follow directions or instructions and be able to write for their own purposes", she says. "Computer literacy, word processing, creating simple documents, typing skills, the transfer of information to computer all involve problem solving and decision making skills."

Kay sees the gradual demise of print literacy not as a threat but as a challenge. Teachers (and their students) need to become ". . . more screen orientated". She laments the impending decrease in teaching personnel that may come because of the new technologies but says that programmed learning is the way of the future.

Jenny agrees: "Publishing copies on a computer, kids see the typed form as being important, and therefore their writing as also important. Technology has created a whole new language, but it will make reading more—or at least equally—important."

Unlike her colleague, she predicts that there will always be a need for teachers to pass on the conventions of print and language.

Carmen believes that language is changing and taking an increasingly standardised form. She thinks that the way we communicate will change with technology, that person-to-person communication is becoming unnecessary now that we can receive information from CD-ROMs, etc. rather than from library copies of an encyclopedia. Even the way we live is changing; cooking and domestic tasks are being ever reduced. "In traditional areas of employment, manual work is decreasing while mental work increases", she says, ". . . and this is producing both positive and negative qualities in this changed environment; it's also leading to problems in areas like school funding."

## **5. Literacy**

The subject of literacy is dear to the hearts of the teaching staff at this school. Around the administrative office walls hang an impressive number of awards and honours. SPS received the DSE Director General's Award for "Excellence in Literacy" in 1996.

With the demands of the new technologies, these teachers see changes in the nature of literacy teaching.

Jill feels that literacy learning via the screen is not sufficient. "Books are needed for their tangible qualities," she says, ". . . we need to find a balance between computer instruction and conventional teaching strategies."

Carol is concerned about the changes she identifies in her current crop of students. She feels that today's kids have become far too dependent on technology for their entertainment, "Kids now are getting so that they can't even play unless they are organised by somebody. And kids without TV are already seen as being weird; perhaps the same will happen with Information Technology soon." She cites her experience with technology during the Atlanta Olympics when school children were encouraged to send Herograms to the Australian athletes, "We tried email during the Olympics, but couldn't get through," she says, ". . . technology can be much more time consuming than conventional methods and for little result."

The following observation was made during the second last week of term when students were tidying up and therefore does not necessarily reflect the usual practice. However it does serve to highlight the limitations of the current networked computer room and subsequent student frustration (Endnote 1).

### Observation Notes I– Yr 5/6

2 p.m. Students are seated on the floor outside the room while the teacher (Jenny) directs a student to complete a spreadsheet. She calls on another student to open a file using her password. She then explains to the class on a computer what to do in order to print off– then file/delete. Students are directed to clean up all of their individual folders except the shared class folder.

2.07 p.m. She directs individual students to the older Classics machines and then marks off their names; the remainder go to sit at the Performas. Suddenly, there is a noisy intrusion as a bright orange wasp invades their space. There is some calling out before it is promptly dispatched by the teacher. One boy calls from a corner, "Yeah that's right, Miss is the Exterminator!" This is followed by general laughter and applause.

2.10 p.m. Classic users log on while Performa users wait impatiently. The slowness of the system invites unsettled behaviour and reveals the varied ways that students wait, including sitting in silence, the rhythmic slapping of thighs, talking and calling out.

2.17 p.m. Not all students have logged on yet, as the system is so slow. They are using the "At Ease" system, and the students say that only one document is able to be deleted at once (Endnote 2).

Students walk to the teacher for assistance

(The G & T class appears to have up to 3/4 pages of files compared with the 7/8 individual ones for most of this group)

2.29 p.m. The teacher repeats instructions for individual students who have forgotten what to do. Students on the Performa are much quicker and commence playing games while the others have bets as to whose document will print first!

2.35 p.m. Danielle shows me *San Diego Zoo* (CD ROM) and the information on tigers. Other applications being used widely by students include the *Guinness Book of Records* and *Mavis Beacon's Typing Tutor*.

At 2.55 p.m., the class leaves after their screens are checked and they are instructed to sit on the floor outside the computer room.

As the computer co-ordinator, Jenny is conscious of the way children are attracted by the newer technologies. She thinks that the literacy revolution has already begun, "Teachers are becoming more aware of the need to teach kids to re-read, edit, to try alternatives, and not be satisfied with one answer. We need to teach freer and more lateral thinking."

When asked in what ways their own teaching is changing in order to accommodate these literacy demands, most teachers emphasised the increased need for flexibility.

Kay is conscious of the need for a lot more planning, particularly when including things on computer. She sees this as an effective—though time consuming—way of catering for the individual needs of her students.

Carol takes a pragmatic approach to these demands. She identifies the technologies as being strong motivational tools, "There is so much in the curriculum; you need to use whatever you can to accomplish everything," she says. "My students are usually working on different activities at the same time, so I can no longer use a lock-step process."

Carmen admits that she needs to brush up on her computer skills in order to cope as she is finding that often the kids are more advanced than she is. Unlike some reports of teachers and their fears about technology taking over, this doesn't present a threat to her, for as she says, ". . . you teach them and they teach you" (Durrant and Hargreaves, 1996). She has seen a greater emphasis develop in the school on publishing kids' work. She encourages her students to type up their work and put it in books or up on the wall. For her, a keen eye for editing is still one of the most important skills she can develop in her students.

The computer co-ordinator is committed to providing more flexible access to computers for the entire school, and says that regardless of where she is or what she is doing, ". . . computers are always at the back of my mind. I am constantly questioning the best use of the technology to enhance student learning." Jenny is also constantly looking for new opportunities for students to practice their word processing and desktop publishing skills. "Because there won't be a specialist computer teacher at SPS in 1997," she says, "I know that there is going to be far more responsibility that will fall on classroom teachers' shoulders."

This sense of increased pressure on classroom teachers is evident in many of the responses.

Carol talks about having to do much more now. "It is often a 7.30 a.m. start these days, which I never did 10 years ago, and I'm often here until 6 or 7 o'clock at night." She finds that there is much more accountability demanded of teachers by parents, the principal, the Department of School Education and the community at large. "Outcomes based education leads to more teacher work," she says, "but it's valuable, nevertheless." She also believes that there is a great deal more education of parents needed these days, particularly in the ways that student progress is being reported.

Jill agrees, but thinks that outcomes based education has improved reporting techniques in the five years since she began as a Kindergarten teacher. "The Computer room had two old Apple IIEs and that was it, when I first began; we had to contend with parental perceptions of computers as just being toys for playing games."

While Carmen is the least experienced of this group of teachers, even she has had to adjust her teaching methods over the past 12 months. "Teachers need a greater awareness of computers and how kids relate to them," she says, ". . . in this school, all kids get some access. Computer education is desperately needed in University undergraduate work; I think it's as necessary as learning how to teach literacy and numeracy!"



Five years ago, Kay was an ESL teacher in Metropolitan West in Sydney. She thinks that experience was a good preparation for what she is doing now. "I'm better able to cope with slower kids, and with the school's strong group emphasis, I can quickly identify individual skill levels and needs."

Ten years ago, Carol was a Year 3 class teacher with no computer in her room. Five years later, she had a computer in her room, but she was not computer literate. Looking ahead now, she wonders if teachers might eventually become obsolete. "Perhaps we'll be like a sort of supervisor," she says. Nevertheless, she hopes some form of interactive role for teachers is still needed in the future.

Jill thinks that the classroom will take on a changed appearance. "There'll be more computer centres, and the Library will be a different type of resource where the encyclopedia will be online rather than on the shelf." She thinks that money will continue to be the main restraining factor for schools, however.

The library at SPS is very much at the early stages of this type of development, but Internet access is supported by a school policy which requires proficient users to teach other students.

#### Observation Notes II

12.30 p.m. Students are working in groups doing brochures on the town of Spur. They will complete the task on paper using pens and pencils for graphic description, then they'll put their work onto the computer.

Students who finish their task are able to go to the computers to access games (*Spectre Challenge*, the *Tortoise and the Hare* book on CD-ROM— Living book series— and also *San Diego Zoo*).

12.50 p.m. Teacher: "People who haven't finished brochures can hand them in and swap over with those on the computer for the last ten minutes." Students get up and go to the computers where there is minimal fuss over the changeover or they stand behind the chairs of those who are already there. There is a considerable degree of social interaction that takes place.

12.55 p.m. One boy complains that the *Tortoise and the Hare* won't complete. The teacher comes over, has a look, and says, "I know why: this is supposed to be *Grandma and Me*, and someone has changed it in the hard disk". She exits the program and relogs *Grandma and Me*.

1 p.m. The bell goes. The Librarian keeps a logging sheet to make sure that everyone is getting a fair go and also to monitor heavy access of the computer.

The students are called to stand by their desks and dismissed.

(New policy for 1997 will be that students who have used the Internet must introduce some one else to it and show them how to access it before they'll be allowed to have another turn.)

Jenny's predictions are quite conservative ones; she feels that there is likely to be a combination of access to a number of networked classroom computers and the conventional laboratory where kids use the technology on a needs basis. "Computers will be a basic tool for all children and will perhaps take over from pens and paper," she says, ". . . there will be an increased ratio of computers per child in every school". She expects her role as teacher to become more one of supervising students' Internet connections, of facilitating their contact with each other and overseas schools. She also predicts that the technology will move rapidly towards becoming voice activated and far smaller. Her principal concern is that centralised decision making will be based on a city philosophy on computers and technology and that the needs of rural centres like Spur will not be taken into account.

## **6. Distinctive features of the practice**

The teachers interviewed at SPS all have very different background experiences with the new technologies, but each one is committed to melding the old with the new.

Kay did a number of computer courses in her degree at UNE and now sees her role as one of ". . . passing on information and strategies, of increasing kids' knowledge about computers". She's also looking to broaden her own experience of what information technology can be used for in the classroom setting.

Carol is looking to try and base her whole program on the utilisation of IT, but ". . . not just whizz-bang stuff!", she says. "I use a range of resources of which the computer is only one".

Jill, the Year 5/6 teacher, recognises that in her classroom technology has been under utilised. Nevertheless, she is pursuing a range of tasks and activities involving technology as a reading aid, a wordprocessor, a publishing or drawing tool, and a maths tutor.

Carmen has been using the computer as a reward system with her Year 4 students. Most of their publishing is done in the computer lab, but ". . . at least four kids per day are playing games involving literacy and maths".

The computer specialist teacher—Jenny—says, "The whole basis of my role at SPS has been as computer coordinator here in the laboratory, but in 1997 I intend to encourage greater use within classrooms and by the individual teachers—especially regarding applications suited to work across the KLA's. Personally, I'd like to do more with the Kindergarten class."

### *Mike (District Technology Adviser based in Spur)*

According to Mike, two thirds of the schools in this area have completed the TILT (Technology in Learning and Teaching) program and teacher reactions have been generally positive because of its perceived practical nature. But as he also observes,

". . . just how many have subsequently adapted their own teaching styles and practices to its principles is another question entirely."

Mike sees the next step as being imperative, that of moving from the dominance of word processing to the more imaginative software that is becoming available.

As far as the school aged children in the region go, Mike thinks that the Internet has helped produce a general realisation that there is a big world out there that they can be part of.

The DSE has provided subsidies for rural schools in the use of the Internet. For example, one hour per day of free access for small schools and two hours for larger ones, but Mike sees this as a potential equity issue for country schools in the future where STD telephone access charges exist.

Mike believes that the type of screen scanning strategies now used by students to find information from the Internet is developing new forms of reading techniques requiring both speed and discrimination. According to him, such practices expand children's' inquiry skills.

He cites River Oaks School in Canada that apparently has a computer per student ratio of 2:1 where student projects are no longer paper tasks but multimedia based.

One of the problems with this type of development is that the teachers themselves don't know how to use the technology and neither do they understand its capabilities. "The teaching profession is desperately in need of instruction," he says, "and ready access to advisers who can provide support for their classroom work."

## **7. Issues and implications**

Key issues for consideration at SPS can be loosely bracketed under the following: Technology administration, Student/Staff access and Staff training/expertise.

### *Technology Administration:*

Jenny, the co-ordinator, points to the fact that she will not be administering the program after this year. As with any system, the SPS program 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. The principal acknowledges that someone else will have to put their hand up, though this requires significant measures of interest, expertise and experience and added to this is the need for that person to take on the critical role of teaching colleagues.

Teachers were concerned that devoting time to the upgrading of skills and knowledge in the area of computer hardware and software meant a decrease in time available for other initiatives, which raises issues about what's valued in the overall school mission. This was linked to an awareness of the issue of the widening gap between the

“information rich” and the “information poor” to be found within the student and teacher population at SPS and in the community at large.

Technical issues in terms of equipment and support were frequently raised in discussion with staff. Teachers were concerned that the school would not be able to afford to “keep up with the technology”, i.e., both in terms of upgrading existing machines and purchasing new computer technology as it becomes available and also in terms of maintaining the current equipment (Endnote 3). Students also commented on these points.

*Student/Staff access:*

While access to technology is at an acceptable level at SPS, more needs to be done in terms of the provision of information technology resources outside of the designated computer room and the school library. Some computers are already located in classrooms around the school, but there is little systematic use being made of these resources except by individual teachers who make the time to discover what can be done with/through/by the technology.

Students themselves, when talking about access at SPS, referred to lunch times, before school and timetabled library periods. The issue of continuing to provide access to a growing number of students demanding access outside of class time places continuing stress on the school resources, including the need for more teacher supervision, increased hardware and software purchases and enlarged physical storage locations. Carmen also spoke of the need for more computers in general classrooms and believes that in order for students to further develop their skills they will need wider access to the Internet in terms of the number of machines available and the speed at which they operate.

When asked about the amount of time they would spend in a typical week using the school's technology resources, student responses varied from one Year 6 girl who talked about 1 hour per week, to a Year 3 girl who accessed computers for an hour or more each day, a half hour on Wednesdays in the computer lab and a half hour in the library. Others spoke of far less use, “Not a real lot” said a Year 3 girl, “we don’t talk about it much”. One of the Year 6 girls said, “None, the computer’s broken—but usually it’s once a week for 20 minutes and an hour a week in the computer lab.” All of these students spoke of their desire to use computers more in their learning.

Kay made a number of suggestions for improving student access to computer technology at SPS. These included the relocation of computers in the school; larger blocks of time for class usage; more of a team approach amongst teachers so that they can swap time allocations in the computer lab and either the provision of mobile trolleys for some computers or a switch in purchasing policy to a greater emphasis on lap tops to allow for greater portability. Jill also talked about the possibility of creating senior and junior computer centres as a way of diversifying the use of current resources.

*Staff training/expertise:*

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Staff training is needed urgently just in order to develop basic technology skills for many of the teachers who have not as yet taken on technology as part of their day-to-day teaching routines. In addition, those teachers who have already embraced technology really need to be taken to the next level of competence, .i.e., to learn how to successfully blend the technology into their teaching programs using a variety of software, teaching styles and strategies.

Specific issues that came up in discussion with these teachers include the lack of a formal framework for skilling staff; the need for the school to work more closely with the local community to gain parental support for the school technology program; the need to shift the emphasis from word processing to more creative and explorative uses of the technology, and the need to work closely with the community to develop new ways of resourcing the school's technology program.

Jenny made the point that developing closer links with other schools would provide one way of sharing expertise and resources and purchasing a wider collection of computer magazines for staff and student use would also help share information about new products and processes. The holding of more staff meetings in the computer lab so that software could be trialled, etc. was also favoured.

In addition to hardware and software, teachers expressed their desire for more resource teachers who could share their information technology interests and expertise. For these teachers, teacher development programs are needed that are centred on computer education or teaching with computers rather than the learning of computer basics for teaching kids about computers (Endnote 4). They also feel that there is a growing need for computer software companies to work closely with the DSE in developing programs that specifically relate to the school curriculum.

All of this points to the issue of current and future pre-service education programs. The teachers who are perhaps doing the most with technology at SPS are by and large those who have recently graduated. However, this is not necessarily because they received adequate training in their undergraduate programs but often because they learnt how to word process at university in order to prepare their own assignments. More needs to be done at the university level in ensuring that no education graduates come out into the schools without having some expertise in using the technology themselves, and more critically—without knowing how to incorporate the technology into their own teaching methodology.

### **Endnotes**

1. Since the observation visit, the computer room has been updated and all of the computers are now on ethernet cabling. This has dramatically increased the speed of student logons; in the words of one of the teachers, "It's now heaps faster!".

2. As with the ethernet cabling, a new "At ease" system has also been installed since our observation visit; according to Ken, the principal, it is proving to be much faster and far more user friendly.
3. As part of the NSW DSE technology policy, computers are now under a Government lease arrangement, so that the technology doesn't actually belong to the school. It is hoped that this will allow for constant upgrading of equipment and allow schools to remain abreast of new developments.
4. Recent communication with the school reveals that in the first semester of 1997, three training sessions were held for staff to extend their own technology skills and to brief them on ways in which technology can be incorporated into their everyday teaching.



## CONCLUSION

Findings from the site studies identify a range of issues and implications about technology and literacy education concerns. In Volume One these have been organised and discussed in terms of three *patterns* and four *principles*. We call the *patterns*, complexity, fragility and continuity, and the *principles*, teachers first, complementarity, workability, and equity. Together these patterns and principles provide a framework helpful in understanding educational concerns across a number of specific school situations, as well as in making sense of how school practice is restrained and/or enabled to reach desired student learning outcomes. Specifically, the site 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. Readers interested in the discussion of issues and implications arising from the sites studies are directed to Volume One. By way of conclusion here we summarise briefly some of the ways in which the site studies speak to inservice teacher professional development, preservice teacher education, and theoretical guidance for change in classroom practice and school reform.

First, in the inservice teacher professional development domain, the enthusiasm of colleagues, on the spot, is crucial to the success of the integration of technologies 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 fully technologised literacies. The teachers themselves can identify the ways of learning that work best for them and the kinds of support they most need. That, too, might mean reconceiving their roles within the school, local and global community as mutually informative learners. Perhaps these ways and means need most of all to be underpinned by the teachers' convictions about the entitlement of their students to a comprehensive literacy for a technologically saturated future. Telling cases like those presented in this volume 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. So practices are developed, and over time an ethos—a culture—can be built.

Second, in the domain of preservice teacher education, if the next generation of teachers is to successfully engage students using the new technologies, then keyboarding skills and basic familiarity with information technologies and their educational implications must become a compulsory feature of future teacher education programs. Such instruction may well lead to a reconceptualisation of the teacher's role in the classroom and the kinds of technologies which support a learner focused rather than a teacher centred environment. All of this points to the issue of current and future pre-service education programs. The teachers who are perhaps doing the most with technology are arguably those who have recently graduated. However, this is not necessarily because they received adequate training in their



undergraduate programs, but often, because they learnt how to word process at university in order to prepare their own assignments. More needs to be done at the university level in ensuring that no education graduates come out into the schools without having some expertise in using the technology themselves, and more critically—without knowing how to incorporate the technology into their own teaching methodology.

Finally, in the domain of theoretical guidance to change in practice and school reform, the patterns and principles can serve as guideposts to consider both the critical and cultural dimensions of literacy. Across most of the cases, this undoubtedly had a lot to do with the fact that students and teachers alike were actively learning new applications. 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. On the other hand, 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 addressing the implications of the patterns and principles within future policy directions and professional development and teacher education initiatives.

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