Communication - Information Technology and First Language Teaching: The International Experience

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Abstract

Literacy, technology and classrooms: The challenge for teachers

This paper describes an Australian study of literacy, technology and learning. The research was formulated in response to a number of key questions: How may literacy teachers learn to use new technologies effectively in their professional work?

What pedagogical models are useful for teachers? What count as sound uses of new technologies in classroom-based literacy education? The research project was particularly concerned with trying to explain how an understanding of the complex relationships between literacy and technology can be translated into workable pedagogical practices.

The study comprised a number of key components. First, theoretical perspectives that take literacy, learning and technology into account were formulated. Second, policy documents, national state and local were examined to see what they had to say about literacy and technology issues. Third, 11 sites, representing 20 P-12 classrooms, were investigated. From the analysis of the sites, the study identified three broad patterns: 'complexity', 'fragility' and 'continuity'. In addition, the data were analysed in terms of four principles: 'teachers first', 'complementarity', 'workability' and 'equity'. These patterns and principles were useful for making sense of the site studies and helped formulate concrete recommendations for stakeholders in education in at least three domains: inservice teacher professional development; preservice teacher education; and theoretical guidance for changes in practice and school reform. Drawing on the study's recommendations for teachers in schools and on some further work by Colin Lankshear and myself (Lankshear & Snyder, in-press), the paper concludes with practical suggestions for how schools might approach the effective integration of new technologies into first-language curriculum.

Bio-details

Dr Ilana Snyder is a Senior Lecturer in the Faculty of Education, Monash University, Australia. Her research focuses broadly on the sociocultural impact of the new information and communication technologies in education and specifically on the new literacies and changes to pedagogical practices associated with their use. Three books, *Hypertext: the electronic labyrinth,* (New York University Press, 1997), *Page to screen: Taking literacy into the electronic era* (Routledge, 1997), and *Teachers and Technoliteracy: Managing literacy, technology and learning in schools (*Allen & Unwin, in-press) explore these themes.

Literacy, technology and classrooms: The challenge for teachers

Ilana Snyder

Identifying the challenge for teachers

We have entered a new era in literacy education. New technologies have radically altered everyday modes of communication. Indeed, they are becoming so fundamental to society that most areas of social practice in day-to-day life are affected by the 'information revolution'. In a world increasingly mediated by communication and information technologies, teachers of the Greek language, what I call in this paper 'literacy teachers' simply cannot afford to ignore the implications of the use of new technologies for literacy practices.

Much has been written and said about the information revolution, with varying degrees of clarity. Discussions of the impact of the new technologies are often clouded by hype. Enthusiasts openly embrace the technologies, claiming they offer a panacea for educational problems, enhance communication, empower users, and democratise classrooms. At the opposite extreme, 'demonisers' exude cynicism about the technologies' apparent powers. Some dismiss them simply as new instructional and communication tools. Others reject them outright as yet a further form of social control or enforced consumption, which promotes the interests of state and corporate sectors. Clearly, extreme responses are of limited use, and the need to move beyond them increasingly urgent in education.

The challenge for teachers of the Greek language - that is, literacy teachers - is to understand the ways in which the use of new technologies influences, shapes, perhaps transforms, literacy practices. The challenge is also to understand how to use the new technologies efficiently, ethically and responsibly with a view to tapping their educational potential. Most importantly, literacy teachers need to realise that there is not much point in trying to accommodate new technologies to existing classroom approaches to literacy education, as such teaching merely ends up looking much the way it always has except more 'technologised'.

A number of questions quickly arise around the role and significance of new technologies in literacy education. These include:

- How are literacy and technology related?

- What are the emergent literacy practices associated with the use of new communication and information technologies?

- How can literacy researchers make sense of the relationship between literacy and technology to develop sound theoretical understandings that may inform effective pedagogical practice at all levels of education?

These and similar questions were at the heart of the *Digital Rhetorics* project which is described in the next section.

The *Digital Rhetorics* project

Digital Rhetorics was a two-year, national study that investigated the relationship between literacy and technology in teaching and learning (Lankshear et al 1997). It focused on three main elements:

1. an investigation of technology and literacy practices in a range of learning contexts, mainly primary and secondary classrooms;
2. a study of selected key policy documents concerned with teaching and learning in relation to literacy, technology and learning; and
3. the development of a theoretical position to inform the approach to the study as a whole and the recommendations resulting from the investigations.

The project was conducted by a research consortium, with members from New South Wales, Queensland, Victoria and Western Australia, under the joint leadership of Colin Lankshear and Chris Bigum. The members of the team were: Cal Durrant, Bill Green, Eileen Honan, Wendy Morgan, Joy Murray, Ilana Snyder and Martyn Wild. The project was funded by the Department of Education, Employment, Training and Youth Affairs through the Children's Literacy National Projects Program.

The study adopted the stance that in the context of increasing and changing demands for literacy and technology learning worldwide, education must enable students to become proficient in the 'operational', 'cultural' and 'critical' dimensions of literacy and technology. This includes understanding how contemporary economic, social, technological, administrative, organisational and political changes are impacting on social practices of literacy, technology and learning - changing them and the relationships among them. That they are making an impact is undisputed; less clear are the kinds of literacies important in this context of change. They potentially include skills in the visual media associated with most technological applications, together with many new communication and information literacies.

Within the constraints of this paper, it is impossible to do justice to all three aspects of the study. I have decided to elaborate the sociocultural approach to literacy and technology that informed the research. I then present the recommendations for practice that emerged from the analysis of the site studies - the empirical core of the project. Readers interested in learning more about the theoretical work of the study, the literacy and technology policy analysis and the site studies themselves are referred to the four-volume report (Lankshear et al 1997) and to the book, *Teachers and technoliteracy: Managing literacy, technology and learning in schools*, which will be published by Allen and Unwin in March 2000 (Lankshear & Snyder, with Green in-press).

A sociocultural approach to literacy

Integral to a sociocultural approach to literacy is the understanding that literacy is more than the capacity to encode and decode - to grasp meanings inscribed on a page or a screen, or within an established social practice (Street 1984). Being literate also involves the capacity and disposition to scrutinise the practices and universes of meanings within which texts are embedded. Being literate entails the capability to enter actively into creating, shaping and transforming social practices and universes of meanings in search of the best and most humane of all possible worlds.

In opposition to reductionist and mechanistic views of literacy and learning, a sociocultural perspective argues that technoliteracy, seen as social practice, has three dimensions: the 'operational', 'cultural', and the 'critical' (Green 1988). The three-dimensional (3D) model exhorts researchers and practitioners not to focus simply on 'how-to' knowledge, understood as technical competence and 'functional literacy'. Instead, researchers need to build understandings which complement and supplement such knowledge by contextualising it in ways that pay due attention to matters of culture, history and power and recognise that it is counter-productive to start with issues of 'skill' or 'technique', outside of an 'authentic' context of situated social practice (Durrant & Green 1998; Lankshear & Snyder, in-press).

The 'operational' dimension of literacy education involving new technologies, focuses on how to operate the language system as well as how to operate the technology system. With respect to the language system, this involves learning how to make it work for individuals' own meaning-making purposes. With respect to the technology system, it involves learning how to make a computer operational, how to 'turn it on' and make it 'work'.

Understanding and being able to draw upon the 'cultural' dimension of literacy involves realising that the ability to operate language and technology systems is always in the service of participating in 'authentic' forms of social practice and meaning. People always use texts and technologies to do things in the world, and to achieve their own, and others', purposes, whether in the context of school, work or everyday life. This means putting the emphasis on 'authentic' contexts, forms and purposes, of learning along the axes of literacy and technology and text and information.

The 'critical' dimension means that teachers and students need to be able to assess and evaluate software and other technology resources in a spirit of informed scepticism (Snyder 1997; Durrant & Green 1998; Lankshear & Snyder, in-press). That is, they need the ability not only to use such resources and to participate effectively and creatively in their associated cultures, but also to critique them, to read and use them against the grain, to appropriate and even re-design them, as well as to be able to actively envisage and contribute to transforming social practices as they judge appropriate.

Understanding the 'operational', 'cultural' and 'critical' dimensions of literacy includes getting a handle on how contemporary economic, social, technological, administrative, organisational, and political changes are affecting the social practices of literacy, technology, and learning. It also includes understanding how these changes are altering literacy, technology and learning and the relationships among them. Further, it incorporates understanding how current changes are placing new 'premiums' on literacy, technology and learning - raising them to new heights of urgency.

Most importantly, understanding the 'operational', 'cultural' and 'critical' dimensions suggested to the *Digital Rhetorics* research team how to frame research questions about the changes to literacy practices associated with the use of new technologies. The project aimed not to focus just on 'how-to' knowledge, understood as technical competence and 'functional literacy'. Instead, it sought contextualised research knowledge informed by the 3D perspective of technoliteracy as social practice.

The site studies

The aim in the site studies was to research, describe and analyse practices in a range of exemplars. By 'exemplars' we did not necessarily mean 'best practice' in the sense of ideals to be emulated, although some of the sites did approximate to this meaning of 'exemplars'. Instead, we approached exemplars in terms of informative and illuminating examples of what was going on in learning on an everyday basis across a range of circumstances, policy and resourcing arrangements, and professional knowledge bases.

The 'patchwork quilt' produced describe diverse models and circumstances that colour instances of current practice. The quilt drew on brief, but intensive and highly focused, investigations of eleven research sites - twenty teachers and their classrooms - in three Australian states, who agreed to participate in the project. Selection of sites drew on advice from personnel in state education departments, and on the local knowledge and professional development connections of the investigators. They were located in NSW, Queensland and Victoria. A range of geographical locations were represented: inner city suburbs, outer city suburbs, satellite cites, regional towns and small settlements in rural areas. Classrooms from lower primary to upper secondary were covered. Key learning areas were English, Technology, Studies of Society and the Environment, Science, Maths and the Arts.

We wanted to witness, 'capture' and describe a range of illuminating instances of practice using new technologies in literacy education: looking for telling cases, so to speak. In most cases, data were collected over just three or four days. These data included contextual or background

information; artefacts (for example, policy documents and statements, lists of technology resources, descriptions of student work); audiotapes and transcripts of interviews; and observation notes. Our emphasis was on finding and describing illustrative instances of practice - particular events or episodes that were likely to be similar to other events and episodes, both at that site and at others. The focus of the analysis and interpretation of the data was on what the descriptions could tell us about how to achieve the kinds of practices and outcomes we believe schools should be seeking.

Consequently, our investigations in no way pretend to be exhaustive of all that went on in these sites. Neither do the portraits claim to be representative of practice as a whole in these sites, still less of schools at large. We describe practices as we saw them to illustrate significant points about literacy, technology and learning. 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. The aim was to use portraits of classroom activities for illustrative purposes. The ideas emerging from classroom portraits were then linked to larger patterns and principles which were intended to enhance future practice on a more extensive scale.

So far as possible, we 'triangulated' data from different collection sources - policy documents and other artefacts, interview material, observations - and across different episodes within single sites and between different sites. Consistencies across these variables increased our confidence in the data collected. We also checked our data-based descriptions against diverse reports of research provided by other people in other contexts as a test of likely authenticity and reliability.

We did not attempt to provide genuine ethnographic accounts of the site-based practices, but to interpret what we saw by reference to the best available theory and research. The focus in the study was on what the descriptions can tell us about how to achieve the kinds of practices and outcomes we believe schools should be seeking.

A template was developed for writing the sites studies. The components were: the study at a glance; the site; the policy context; the practice; distinctive features; and issues and implications. We produced detailed accounts of each site (Lankshear et al 1997). Our analysis drew on the theoretical, conceptual and policy aspects of literacy and technology. At the same time, we allowed the data from the site studies to inform and enrich this wider work in a reciprocal way. Just as our analysis of the data was influenced by our wider conceptual and theoretical frameworks, so were these frameworks in turn clarified, refined and enriched by our data.

We identified three broad patterns which we called 'complexity', 'fragility' and 'continuity'. I outline them briefly here, but readers are referred to the *Digital Rhetorics* (Lankshear et al 1997) report and to *Teachers and Technoliteracy* (Lankshear & Snyder, in-press) for detailed explications of the patterns and principles.

Complexity

Classrooms are 'complex' in the sense of having a large number of inter-relating components, operating within and beyond them. Viewed from this perspective, classrooms are complex, self-organising, adaptive systems: they have to arrange themselves around the interactions between their various human and non-human components. Each time a new component - such as a new technology - is added, it does not simply feed one more 'thing' into the mix in a linear way: rather, its introduction produces a compound effect. When we add an Internet connection, for instance, it brings with it into the classroom a whole new set of agents - remote computers, students and teachers in other parts of the world - all of which impact in complex and often

unpredictable ways on what occurs. Involvement in projects with groups elsewhere changes the nature of classroom projects in profound ways. It is no longer simply a matter of adapting to local conditions, as was often the case when print prevailed. Now classrooms have to take account of different cultural ways of interacting, become culturally sensitive, handle language differences, understand ranges of experience and world views, and deal with various technical complications such as managing telecommunication links.

Fragility

To be effective, the components of self-organising systems such as classrooms must assign roles successfully among themselves. When a component is unable to play its role in a classroom - whether it is a teacher, a student, a computer, a modem, or a phone line - it is unlikely that the classroom will be able to reorganise in a way that allows computer use to continue in curriculum work, at least, in the short run. Classrooms are especially sensitive to the loss of certain components, such as an expert teacher, a key support person, an essential piece of software, or a phone connection. Fragility was woven deeply into the fabric of practice in several classrooms in the *Digital Rhetorics* study, exacerbated in some cases by the norm of teacher-centred curriculum and pedagogy.

Continuity

Effective learning programs call for continuity from point to point, as well as across individual components of programs. Continuity breaks down where, for example, students do computing-rich work on a regular basis one year and rarely get to use a new technology the next. Discontinuities can also arise where there is inadequate programming for scope and sequence, and where there are uneven concentrations of new technology resources - human and non-human - within schools and between schools. As schools and classrooms are complex systems, uneven concentrations of expertise and equipment are to be expected, and achieving more even distributions is not easy. Nonetheless, continuity must be pursued strategically, especially within a school and between local schools including the transition from feeder primary to secondary schools.

In addition, we analysed the data in terms of four principles: 'teachers first', 'complementarity', 'workability' and 'equity'. I now explain them briefly.

Teachers first

'Teachers first' asserts the imperative to take account of the needs of teachers in learning new technologies and their relationship to literacy education, even before tackling the needs of students. The reasoning behind this principle is that for teachers to make informed educational choices about using new technologies in classroom practice, they must first know how to use them, and any benefits of doing so, for their own purposes. In other words, teachers need support in making use of new technologies to enhance their personal work before learning to use them in their teaching.

Complementarity

'Complementarity' emphasises the importance of understanding, in as broad a context as possible, just what is involved in adopting a particular technology. To use a technology effectively is rarely a matter of learning some simple, self-contained, exhaustive skill. Effective use is typically a matter of becoming proficient with a range of interlocking, complementary procedures, knowledges, understandings and dexterities. A good example is learning how to use a calculator. This is not simply a matter of switching the apparatus on and pressing function and number keys. To use a calculator effectively requires at least two complementary skills:

ability to estimate an answer and knowledge of significant figures. Similarly, complementarity also holds for computing technologies - such as using the Internet for gathering information and using presentation software. We need to pay attention to the complementary skills and knowledge necessary for sensible, purposeful use of hardware and software.

Workability

'Workability' signals the acid test for implementing any new technology in schools: Does it improve the teaching and learning cycle? And, if there is improvement, is it a better alternative to innovations that could otherwise be considered? To assess workability when introducing new communication and information technologies means taking into account hidden costs, such as those associated with teachers' time in learning how to use them, with redesigning curriculum, and with modifying learning programs. Workability demands that the use of any hardware or software demonstrably improves, helps, or supports the work of teachers and students. Workability also needs to affirm that teachers' and students' work is a priority in deciding whether or not to implement a given technology. Adopting new technologies always requires an ethical approach that acknowledges actual costs associated with taking them on.

Equity

The 'equity' principle affirms that decisions about resource allocation are always involved in using new technologies. Decisions are often made more difficult because new technologies tend to get concentrated in particular curriculum areas, and they certainly get concentrated in relation to economic resources. In some cases, decisions to allocate resources toward new technologies, as a means to upgrading and re-equipping a school, build on prior knowledge of existing resources. Having some communication and information technologies in the first place, or, at least, some quality information about them, provides an advantageous base from which to make decisions. Take-up is made difficult where resources and expertise are unevenly distributed - between schools or across curriculum areas within a school. Schools and curriculum areas that are 'resource poor' in equipment and knowledge end up getting less, while those with some, get more - the principle of increasing returns. It is important to build up sufficient knowledge in disadvantaged areas to enable them to attract material resources by 'natural' means - that is, by making sites that are 'knowledge-poor' less so. Likewise, schools must be able to pursue effective strategies to buffer disadvantaged students from the effects of the uneven distribution of material resources and information. Equity has direct significance for dealing with issues of continuity and fragility.

These patterns and principles were useful for making sense of the site studies; making decisions and judgments about various aspects of what we saw; and helping us to formulate concrete recommendations for future actions. We concluded that the site studies could inform all stakeholders in education in at least three domains: inservice teacher professional development; preservice teacher education; and theoretical guidance for changes in practice and school reform. It is important to note that *Teachers and Technoliteracy* (Lankshear & Snyder, in-press) identifies two further patterns of practice and one more principle for practice.

With respect to inservice teacher professional development, the enthusiasm of colleagues is crucial to successful integration of technologies into the curriculum. However, reliance on a few enthusiastic individuals can lead to fragility. Little short of a major change to a school culture is necessary if teachers are to help students develop technological literacies. The domain of preservice teacher education is crucial - a sound basis in information technologies and their educational implications must become a compulsory and effectively handled feature of teacher education programs. Finally, the patterns and principles are able to serve as guides to handling the very important cultural and critical dimensions of effective literacies. Relatively little critical emphasis was evident in the sessions observed across the entire project. This may indicate the extent to which classroom practices involving new technologies are being exhausted on merely

getting to grips with the operational dimensions. If this is what is happening it is perfectly understandable - given the relatively limited prior experience many teachers have with communication and information technologies. But it reinforces the importance of attending to all the patterns and principles identified here within future policy directions, teacher education programs and professional development initiatives.

Practical suggestions for teachers in schools

In the following sections, I make suggestions for practice that draw not only on the *Digital Rhetorics* project but also on the book *Teachers and Technoliteracy* that I co-authored with Colin Lankshear (in-press). For a fuller explication of how schools may integrate new technologies effectively, please refer to the book itself.

A whole-school, high-commitment response

Enhanced practice at the literacy-technology-learning interface calls for a good deal of reflective and interpretative work. Some of this work can be done by individuals on their own initiative. It is important, however, that a lot of it be undertaken collaboratively in the process of building a culture at the whole-school level, as well as in smaller groups and partnerships, based on shared interests and other sources of affiliation.

The first practical suggestion for schools, committed to enhancing classroom practice at the literacy-technology-learning interface, is to initiate regular, all-staff activities, which analyse the school's current situation, using the concepts, patterns of practice and principles for practice developed in the previous sections of this paper. The activities could be seen as a form of purposeful, school-based, professional development, which is articulated with school-based policy, planning and program development. Although such professional development will be demanding anything less would be a partial response to the challenge.

A program of one to two hours fortnightly would be scheduled, with staff attendance required, paid attendance by teacher aides encouraged, and all staff responsible for leading at least one session. At each session, one or two staff members would briefly introduce and explain a key concept (for example, the 3D model of social practices), a pattern of practice (for example, fragility) or a principle for practice (for example, teachers first). For the remainder of each session, participants, collectively or in groups, depending on staff size, would discuss, interpret and assess the significance of the particular concept, pattern or principle in the context of their school and individual classrooms. They would also brainstorm a range of possible responses to the concept, pattern or principle's implications for practice in their own setting. They would then rank the possible responses, according to importance in the school's priorities for literacy, technology and learning. By the time most or all of the concepts, patterns and principles have been tackled in this way a number of ideas will have emerged. These will help to identify orders of priority and potential approaches to be pursued in strategic planning, needs analysis, and team-building.

Depending on a school's resources and contacts, it could seek paid or voluntary participation from outside personnel with relevant kinds of expertise. These people could include parents of students, connections in the school community area, education department personnel, retailers, academics and researchers. Relevant expertise could range from troubleshooting skills, group facilitation and team-building capabilities, technical knowledge relating to resourcing options, policy development capacities, and familiarity with related social practices involving new technologies.

While this kind of activity and commitment is taxing on resources of energy, time, and goodwill, it can be powerfully educative - particularly when it is well-planned, well-managed, and when

tasks are equitably distributed. Indeed, it may well yield more lasting and deeper educational consequences than other equally challenging options, such as doing a degree or diploma course and organising fund raising to meet budget shortfalls.

This type of initiative will only work, however, if there is strong leadership from the principal, senior administrators and members of staff who have the authority and respect. On any staff, of any size, there is likely to be a mix of more and less enthusiastic participants - including those who are very reluctant. Unless leaders are seen as fully committed to the exercise, it is unreasonable to expect such initiatives to succeed as a culture-building and a culture-changing endeavour. By the same token, if a school is serious about meeting the challenges, this is precisely the kind of authoritative leadership and collegial commitment necessary.

Strategies, activities and applications

In this section I describe four sets of strategies, activities and applications that flow from the study.

1. Pedagogical principles

The following three procedures are designed to enhance teaching and learning in the area of literacy and new technologies.

a. Think social practice in three dimensions (3D)

Effective learning builds on understanding the rationale of what is being learned and how it fits into a larger scheme of human activities. Students need to understand the point of what is going on. Learning is a process of entry into some social practice where people, words, beliefs, actions, tools, artefacts, values, standards, goals, and purposes get integrated in meaningful ways, and where we come to see what is involved in playing a particular role and performing it proficiently (Gee 1996; Gee, Hull & Lankshear 1996). Obvious as this might be, it is sobering to reflect on the extent to which students fail to learn in classrooms because they cannot grasp the social practice they are supposed to be getting initiated into.

A good rule-of-thumb for all teaching is to clarify to ourselves just what the social practice is that the class is going to be involved in. If we are not clear, it is unlikely learners will be. Moreover, it is only once we have an unambiguous idea of what the social practice is going to be, that we can reflect on the likely points of connection for different groups of learners. Being able to name the social practice that given learning activities belong to is a precondition for being able to make learning explicit and for finding ways of making it accessible to learners with different cultural backgrounds and learning histories (Gee 1996; Gee, Hull & Lankshear 1996).

Getting clear about the underlying social practice is especially important in areas of learning where teachers lack strong knowledge and experience, as is often the case for many teachers when communication and information technologies are used. Young people, who have grown up with new technologies, may become thoroughly confused, or bored and disaffected, when confronted with 'odd' practices introduced by teachers in desperate attempts to find uses for new technologies. To promote effective learning, we need to be as clear and certain as we can that we are involving learners in a coherent social practice with which they can make some genuine connections. The closer we stick to 'authentic' forms of social practice the safer we are likely to be.

The clearer we are about the social practice involved, the better our chances of finding effective ways of enabling learners to become proficient with the operational, cultural and critical dimensions of the literacy associated with it. The more familiar we are with a social practice, the

easier it is to identify its operational, social and cultural dimensions and to scaffold learning activities. Equally, the more familiar we are with alternative versions of that practice, the easier it is to identify its critical dimension, and to generate effective learning activities.

The key point here is that teachers are provided with curriculum requirements to meet, but are left with the task of working out how to structure suitable learning activities. The more transparently we can embed specific learning tasks in meaningful social practices the more likely it is that learners will grasp not only the operational aspects, but the important cultural and critical dimensions as well (Heath & McLaughlin 1994).

b. Begin with the cultural

To integrate the 3D approach into school-based learning, begin by prioritising the cultural dimension. As argued above, classroom learning is ideally linked to real-life and life-like social practices. Effective learning involves making schools and classrooms, as much as possible, into 'worldly', socially meaningful places.

Whatever the lesson or unit of work, and at whatever level of schooling, the task is to find ways of helping learners to become participants in particular communities of social practice, so that they can learn to become proficient members of the groups who engage in that practice. School-based learning should exemplify as far as possible the qualities of mature academic and scholarly practice. The skills of clear thinking, logical rigour and clarity, and a critical notion of design, as learned in school, should carry over readily to applications in the wider world. Although enabling learners to become 'insiders' in the culture of the Science or History classroom will not be exactly the same as enabling them to become 'insiders' in the culture of the research science laboratory of a large company, or to become insiders in the culture of a history project in a university, the fit should be as close as possible.

What does this mean in practical, pedagogical terms? It means, for example, that if school students are to use new technologies for obtaining information to produce reports, this should be approached as an initiation into forms of practice where the emphasis is on knowing: how to access reliable, relevant information efficiently and elegantly; how to ask good questions and knowing what makes the questions good; and when to use Internet sources or email in preference to more conventional sources, and why.

These ideas, however, are at odds with increasingly familiar practices such as having students email students in other countries to 'ask for information'. Whether or not the overseas students are appropriate sources of quality information is debatable. Further, the enthusiasm for using email and making distant contacts may displace the more important learning, which has to do with the construction of knowledge.

Of course, using email to elicit expert opinion does occur within mature communities of research practice. But it is rarely a major source of data, and even more rarely the centrepiece of data collection. The object of classroom learning at the literacy-technology interface, in activities such as writing reports, should be to introduce students, in ways appropriate to their levels, to *bona fide* research procedures and habits. This means, of course, that teachers need to be well informed about research as practice. Unless they are, it is difficult to conceive a sequence of 'research-related learnings' and to translate these into activities involving particular literacy skills and understandings and fitting uses of new technologies. To emphasise use of technologies without adequate attention to foregrounding the structure and point of the practice is likely to confuse students in the short run and to be counterproductive in the long run, as it sets them on a false trajectory.

As Durrant and Green (1998) remind us, the value for teachers of the sociocultural approach to literacy, technology and learning is that it puts education up front. That means emphasising literacy issues in the classroom rather than technology issues - the technology issues are always secondary. Further, integrating communication and information technologies into the first language classroom always involves drawing upon the specific expertise of teachers. Constructing coherent, informed, effective literacy and technology programs requires that teachers' professional judgment and their own theories of literacy and pedagogy become crucial resources for curriculum and professional development .

c. Take careful note of the operational and the critical

Prioritising the cultural dimension of social practice makes the task of dealing with the operational and critical dimensions of literacy easier to handle: easier from the standpoint of both teachers and learners. For teachers, especially those who have limited experience and confidence with new technologies, the challenge is often to know upon which operational skills and understandings to focus. The sociocultural view of learning provides clear directions here. The benchmark will always be provided by the social practice in its mature form: How do the experts do it? What new technological applications, if any, do they use? Which of these can be employed and taught? and, How can these be taught, given the level of the class and the particular aspects of the practice in which they will be involved?

It may be that the operational dimension of a social practice and its associated literacy and technology components may not involve a heavy emphasis on new communication and information technologies. It may also be that a person can be a whiz with operational aspects of new technologies without being especially proficient in the practice as a whole. The pedagogical imperative is to get the emphasis in the right place. If the curriculum requirement is to teach students how to write an information report, there may well be space for introducing operational skills like compiling a table or chart, inserting a diagram, or scanning in a ready-made graph. The demand, however, is that these be relevant, reliable and rigorously produced portrayals of information, and that the ways of determining whether this is so are understood.

As far as learners are concerned, the more apparent the nature and demands of the social practice, and the more significant the practice is seen to be, the more readily students will recognise the meaningfulness and relevance of skill development. Students will be recruited to learning skills more readily if the curriculum requirements are couched in practice contexts that learners relate to and value. Failure to understand the point of a skill, process, or understanding in relation to meaningful practice is a major impediment to effective participation and learning in school. Once again, the teacher's professional ability is challenged to identify appropriate social practices within which to teach specific curriculum requirements and to find ways to map these onto the understandings of the students in a class (Gee 1991; Heath 1983; Heath & McLaughlin 1994).

The critical dimension can be seen as having both internal and external aspects in relation to social practices and their literacies. For example, if students are involved in investigating something about the environment to produce a report, opportunities must be created for them to make critical readings of texts included in their information base, and to make critically informed assessments of the varying perspectives and interests which shape and inform the different texts they are using. These may be conventional print texts or electronic text resources. Such an approach can be seen as critique, which is internal to the social practice of reporting the findings of a text-based investigation. Students are required to make a judgment about where the balance of evidence lies and which views or stances seem most defensible.

However, part of learning what is involved in investigating aspects of the environment, or health, housing, and traffic flows, is coming to see that investigations and their reports are always undertaken from some standpoint or other - as, of course, are the texts which make up

the information base. Therefore, if students are producing reports, they must understand how to adopt a position from which to undertake their work or, alternatively, they must understand how to recognise the position they take up. Who are they, or the authors of informing texts, in this practice? A newspaper reporter looking to make a splash? A parent with concerns about chemical waste dumping in the area? A Green Peace worker? A researcher hired by a strip-mining company? Being able to identify the point of view marks the external component of the critical dimension, where the focus of critique is the practice itself, defined in relation to the position from which it is taken up.

Becoming an informed, effective 'insider' of a social practice is one thing, albeit important - after all, if one is going to participate in a community of practice, the ideal is to be an effective, informed and proficient performer of that practice. However, having a critical perspective on that social practice, as a participant in it, is a different order of things altogether. One might be a very competent environmental writer for strip-mining companies and toxic waste dumpers with the ability to 'win the day' for their interests. But ought one want to be? A critical perspective suggests asking reflexive questions such as: How might one practise this role with maximum integrity?

Since learning is about entry into and participation in some social practice or other that helps shape who and what we are, do, think, value, believe, and aspire to, it is incumbent on teachers to ensure that learners have opportunities both to become competent in socially recognised and rewarded practices and their embedded literacies, and to know how to transform these practices from within as they deem appropriate, or how and when to 'leave' them in preference for others when this seems the proper thing to do. The capacity to foster this kind of learning rests squarely on teachers' understandings of social practices, and of the different perspectives (strip-mine advocate, 'Green,' or concerned parent) from which these practices can be engaged.

2. Strategies for developing policies, plans and programs

a. Plan before purchasing

High quality educational experiences can be augmented by the use of computers, the Net and distance learning but they draw heavily on deep professional knowledge and experience (Shenk 1998). This knowledge includes being able to honour the principle of efficacious learning which requires that what is learned now relates in meaningful ways to what people do later. The task of translating curriculum requirements into learning activities grounded in meaningful, social practices that relate to later trajectory points is demanding. Yet, it underpins a high quality education, and has to be present for the integration of new technologies into effective learning activities.

If schools are to integrate new technologies into high quality, educational learning experiences, they need to do their sums and organise the purchasing of equipment around clear, informed, and careful planning. As far as possible, schools need to ensure that teachers know more than how to drive the machines. To enable them to respond in sound, pedagogical ways to the patterns and principles identified above, teachers need to know about the interdependence between the operational, cultural and critical dimensions of classroom technoliteracy practices.

b. Adopt whole-school, cross-curriculum, integrated approaches to policy and planning

The best response to patterns of fragility and discontinuity, that honours principles such as complementarity, workability and equity, is to ensure that school plans, programs and policies are developed on a whole-school, cross-the-curriculum basis.

Durrant and Green (1998) argue that in today's world the socially rewarded understandings are communication and information skills of the 'symbolic-analytic' variety (Reich 1992). These are not just skills like spelling and keyboarding, but also include those associated with design, critical analysis, and electronic forms of information access and handling.

To help provide a sound initiation into such skills and understandings, schools need to work from an informed sense of the nature and scope of information and communications tools, applications and processes. Curriculum needs to ensure that an appropriate range and balance of information and communications applications and procedures are taken into account. Curriculum also needs to integrate distinctively new technological elements, for example, using search engines, with more established and familiar aspects, such as logical analysis and critical appraisal.

The challenge for schools is to provide a comprehensive, integrated approach to professional development at the interface of literacy, technology and learning, in principled, informed, and educationally effective ways. Our ideals of 'across-the-curriculum, collaborative, whole-school efforts to build a learning culture with links to the community' should be useful in meeting this challenge. At the most overt and tangible level, it involves mapping technological and conventional literacies to subject areas on a topic by topic, subject by subject, semester by semester, year by year basis. This process will help identify areas where individuals and teams need to focus their professional development work, as well as help identify priorities for resourcing, staffing, recruitment, and departmental support.

c. Recruit strategically

One benefit of a holistic approach to curriculum programming policy planning and professional development is that it makes it easier for a school to approach its staffing needs strategically. As positions are vacated or created, schools can proactively recruit new staff with an eye to the sorts of detailed specialisms, as well as more general strengths and experiences, required to maximise their literacy-technology effort.

d. Lobby proactively and disseminate information

Schools are not the only educational organisations that have been caught short in the literacy-technology challenge. Teacher education institutions and education departments are in the same boat. Given the lead time involved in training teachers, the longer teacher education institutions remain under-informed about what kinds of teachers are needed in classrooms, the more slowly schools will adapt to current and future demands. While comprehensive, school-based, professional development initiatives, along the lines described in this paper, can take up some of the slack, teacher education institutions need strong and informed guidance on how to make their programs at the literacy-technology interface more appropriate. Schools, which have engaged in integrated, intensive planning and programming, will be in a strong position to lobby for change in teacher education. There is considerable evidence at present that such change is needed.

In addition, schools that make progress along the lines advocated here will be well placed to illuminate education department policies. At present, many departmental policies, at least in Australia, do little more than emphasise operational competencies - for teachers and learners alike. Moreover, they often harness teacher competencies with new technologies to outmoded routines that bypass the kinds of thinking by teachers called for by a sociocultural approach to literacy, technology and learning. Lists of static, technology competencies for teachers, that are tied to requirements like producing worksheets, assessing student-learning activities, and using at least one or two curriculum and one or two generic software packages, fall far short of what policy guidelines for teachers and teacher educators need to incorporate. Schools can play

important roles in moving policy forward, based on their efforts to tackle the literacy-technology interface in socioculturally informed ways.

(e) Make strategic alignments - but of a different kind

School partnerships with outside organisations and groups are legion in the area of new technologies. Many are with software companies, retailers, and other commercial organisations, which help schools to acquire technology resources. For many schools, this is a necessary strategy for meeting what they see as their resource needs, and we do not underestimate its role here.

Another kind of strategic alignment is also possible - one which is linked to educational rather than infrastructural aspects of learning in the area of literacy and technology. It is a strategy whereby schools seek to build links with individuals, groups and organisations that can provide them with access to sites of 'authentic' social practices using new technologies. Partners can range from small and large businesses and service organisations to churches, clubs, and community-based, cultural workers. Learning opportunities can include spending time in sites of 'authentic' practice, as distinct from hit-and-run field trips, seeing at first-hand how skills, concepts, and activities engaged in class relate to 'real-life' practice and, perhaps, getting opportunities to participate in them.

3. Ideas for professional development

a. Think beyond technology

It is important to avoid the trap of thinking that the main challenge presented by new technologies is to come to grips with them, particularly at the operational level of practice. We simply reassert points suggested above:

- We need to think of both literacies and technologies as embedded in larger social practices, and as related to each other in ways that are tied to the purposes, values, beliefs, and identity-making aspects of these practices. Coming to understand what this means in theory and in practice is a crucial part of professional development.

- We don't learn 'technology' or 'literacy' in isolation from each other, or in decontextualised ways. Rather, we learn through participation in meaningful, social practices.

- We need to develop our understanding of 'authentic' forms of social practice as necessarily involving operational, cultural and critical dimensions.

- We need to inform ourselves about 'authentic' forms of social practice that relate to the more specific learning requirements contained in curriculum statements, policies and syllabi, so we can embed the more specific learnings in contexts of practice that are meaningful to students. Often this may involve forms of practice that are 'non-conventional' for education, such as elements of youth culture, leisure and recreation pursuits, as well as practices associated with life in the home where young people interact with a range of mature uses of technologies and information with friends, or by observing and interacting with older siblings and adults.

- We need to know how to create learning activities that will connect in meaningful ways to what students are learning now with what they will do later in school and beyond school.

b. Engage in professional reading

The references used in this paper provide clues to the kinds of texts teachers will benefit from reading and studying. Many centre on sociocultural accounts of literacy, technology and learning, and involve a fair degree of formal theory and research. There are also other bodies of literature that are useful for teachers to sample in their efforts to inform their practice. Three types are identified here, recognising that there are others. Texts that exemplify each type are included in an appendix.

First, there is a literature relating to the question posed by Bill Green and Chris Bigum (1993) in their article, 'Aliens in the classroom' (although, as the authors suggest, the aliens may well be teachers). They ask: Are there aliens in our classrooms, and if so, who are they? This seminal article highlights the importance for teachers of understanding contemporary forms of youth identities, commitments and involvements. We hasten to add that certain texts we suggest may be borderline in taste for some readers. By the same token, good pedagogy begins with informed understanding of learners, including cultural knowledge of different kinds of youth identities.

Second ,we recommend delving into the burgeoning literature on issues associated with new technologies and social practices. After much initial hype about new communication and information technologies and their promise for social and personal progress, more critically informed and measured appraisals are appearing in accessible forms.

Finally, there are now many books dealing in diverse ways with social practices in cyberspace, emerging cultures associated with new technologies, and subcultures that interact with cultures connected to the use of new technologies. Such texts provide an excellent entrée to the cultural dimension of social practices. Although some of the practices are unacceptable from an educational standpoint, they nonetheless provide valuable material for considering the operational, cultural and critical dimensions of practices involving new literacies and technologies. As some of those listed in the first section, several of these texts might also be on the borders of taste.

c. Participate in collaborative projects

A useful form of professional development involves participating in collaborative projects at the literacy-technology interface based on sociocultural principles. Where communities of practice exist, an effective strategy is to involve participants, who are at varying levels of expertise, so that those who are more 'novice' in one area can learn from others more 'expert', and vice versa, so that where participants have expertise, they can contribute to the learning of others.

One such project is Literacy Web Australia (Schools on the Web 1999 June). It contributes to the Schools on the Web project, where Microsoft, Optus Vision and Aussie Schoolhouse/oz TeacherNet jointly host free Web space for Australian P-12 schools. Any school with an Internet connection and email account can register at the Schools on the Web site (1999 June).

The project aimed to provide opportunities for schools to: showcase best practice involving the intersection of literacy, new technologies and equity; provide a resource of theoretical knowledge in the form of up-to-date literacy articles; suggest links to other valuable literacy sites; encourage purposeful email communication between the schools in the cluster; and give information about the SPSS scheme. As an ongoing project, it builds on collaborative input from teachers, professional associations, researchers, academics, and anyone else with an interest in the topic. The Literacy Web index leads to five main Web pages: Case Studies, Other Literacy Sites, SPSS Programs, Submit Your Project, and Literacy Articles.

At a different level of initiative, professional associations provide a base from which relevant professional development activities can be launched. An example is the 'Teachers First' project

instigated by the Primary English Teaching Association of Australia (PETA): a mostly online, password controlled, professional development program (PETA 1999, June).

Indeed, one useful school-based, professional development exercise would be to conduct online searches to locate Internet-based sites and practices with the potential to support forms of self-initiated, professional development for individual teachers or groups of teachers along the lines we have advocated here. At the same time, we do well to remember that professional development to enhance literacy education work at the interface with new technologies involves a good deal that has nothing to do with new technologies *per se*, and that 'technologies *support* learning and teaching, which always remains the main game' (Durrant & Green 1998, p. 11).

Final comment

This paper has been about how to 'do' literacy and technology in educationally effective ways within classrooms. Most importantly, it stresses that there are vital educational purposes and standards that must not be sacrificed to the technological dance. If and where teachers and schools decide that they will integrate new communication and information technologies into curriculum and pedagogy, it is crucial that they keep these educational purposes and standards clearly in focus. Teachers must beware of claims that happily equates 'data' with 'information', and 'information' with 'knowledge' and 'understanding', making it that much easier to redesign education around information retrieval.

Teachers have always known that an important responsibility of education is to help learners understand how one moves from information to knowledge, and how to make critical judgments about the quality of information. One of the notable trends observed in the *Digital Rhetorics* project is the gap between recognising the distinctions between 'getting information' and 'assessing information', on the one hand, and 'seeking information' and 'coming to know something', on the other. The challenge for teachers is to build these distinctions into computer-mediated classroom work. Failure to enact such distinctions plays directly into the hands of those who would reduce education to information pursuit and retrieval, and who would sell us the 'gadgets' to realise this diminution of a key responsibility. Teachers do well to recall Theodore Roszak's (1996) observation that people who think 'education' and the 'pursuit of information' are synonymous have no understanding of either.

By the same token, these cautions are not intended to establish a case against the educational use of new technologies in schools. I am in favour of pedagogical approaches and supporting technologies that serve educational ends and promote educational outcomes equitably, effectively, and efficiently. In Neil Postman's words, I am 'not arguing against using computers in schools... [I am] arguing against our sleepwalking attitudes toward it, against allowing it to distract us from important things, against making a god of it' (Postman 1996, p. 207). Teachers need to approach the technologising of literacy and curriculum with caution, understanding and wisdom. As I have argued above, we need to ensure that 'education remains the main game' and that technologies, new or old, remain faithfully in the service of that main game.

References

Durrant, C., & Green, B. (1998) *Literacy and the new technologies in school education: Meeting the I(IT)eracy challenge?* Position paper for NSW Department of Education and Training.

Gee, J. P. (1991) What is literacy? In C. Mitchell and K. Weiler, (eds), *Rewriting literacy: Culture and the discourse of the other* (77-102). New York: Bergin & Garvey, New York.

Gee, J. (1996) Social linguistics and literacies, 2nd edn. London: Falmer Press

Gee, J., P, Hull, G. & Lankshear, C. (1996) *The new work order: Behind the language of the new capitalism.* Sydney: Allen & Unwin & Boulder: Westview Press.

Green, B. (1988) Subject-specific literacy and school learning: A focus on writing *Australian Journal of Education* 32, 2, 156-179.

Green, B., Bigum, C. (1993) Aliens in the classroom *Australian Journal of Education* 37, 2, 119-141.

Heath, S. B. (1983) *Ways with words: Language, life, and work in communities and schools.* Cambridge: Cambridge University Press.

Heath, S. B., McLaughlin, M. (1994) Learning for anything everyday *Journal of Curriculum Studies* 26, 5, 471-489.

Lankshear, C., Bigum, C., Durrant, C., Green, B., Honan, E., Morgan, W., Murray, J., Snyder, I., & Wild, M. (1997) *Digital rhetorics: Literacies and technologies in education - current practices and future directions*. Canberra: Department of Employment, Education, Training and Youth Affairs.

Lankshear, C., Snyder, I., & with Green, B. (in-press). *Teachers and technoliteracy: Managing literacy, technology and learning in schools*, Allen & Unwin, Sydney.

Postman, N. (1996) Virtual students, digital classrooms. In B. Henderson (ed), *Minutes of the lead pencil club* (pp. 197-215). New York: Pushcart Press.

Primary English Teachers Association of Australia (1999) June http://www.peta.edu.au [Accessed June 1999].

Reich, R. (1992) *The work of nations: Preparing ourselves for 21st century capitalism* New York: Vintage Books.

Roszak, T. (1996) Dumbing us down *New Internationalist* December vol. 286.

Schools on the Web (1999)June http://www.schools.ash.org.au [Accessed June 1999].

Shenk, D. (1998) *Data smog* Revised and updated edn. San Francisco: HarperEdge.

Snyder, I. (1996) *Hypertext: The electronic labyrinth.* Melbourne: Melbourne University Press & New York: New York University Press.

Snyder, I. (1997). Page to screen, in I. Snyder (Ed.), *Page to screen: Taking literacy into the electronic era* (pp. xx-xxxvi), Allen & Unwin, Sydney & London: Routledge.

Street, B. V. (1984) Literacy in theory and practice. Cambridge: Cambridge University Press.

Appendix

Type 1: Texts that emphasise life and practices in an electronic world

Bennahum, D. 1998 *Extra life: Coming of age in cyberspace* Basic Books, New York

Digitarts homepage. 1999 June <http://digitarts.va.com.au>

GRRROWL. 1999 June <http://digitarts.va.com.au/frames.html>, <http://digitarts.va.com.au/grrrowl1>

Howard, S. 1997 ed *Wired up: Young people and the electronic media* Taylor and Francis, London

Howe, N. and Strauss, B. 1993 *13th Gen: Abort, Retry, Ignore, Fail*? Vintage Books, New York

McCloud, S. 1994 *Understanding comics* Harper-Perennial, New York

Rushkoff, D. 1994 ed *The GenX reader* Ballantine Books, New York

Rushkoff, D. 1996 *Playing the future: How kids' culture can teach us to thrive in an age of chaos* HarperCollins, New York:

Tunbridge, N. 1995 The cyberspace cowboy *Australian Personal Computer* September

Type 2: Texts that focus on issues associated with new technologies

Shenk, D. 1998 *Data smog* Harper*Edge*, San Francisco

Franklin, U. 1990 *The real world of technology* CBC Enterprises, Montreal

Grossman, W. 1997 *net.wars* New York University Press, New York

Kling, R. 1997 (ed) *Computerization and controversy: Value conflicts and social choices* 2nd edn, Academic Press, San Diego

Loader, B. 1998 (ed) *Cyberspace divide* Routledge, London

Robertson, H-j. 1998 *No more teachers, no more books: The commercialization of Canada's schools* McClelland & Stewart, Toronto

Roszak, T. 1994 *The cult of information* University of California Press, Berkeley

Tenner, E. 1997 *Why things bite back: Predicting the problems of progress* Fourth Estate, London

Whitaker, R. 1999 *The end of privacy: How total surveillance is becoming a reality* The Free Press, New York

Type 3: Texts that deal with social practices in cyberspace

Hafner, K. and Markoff, J. 1994 *Cyberpunk: Outlaws and hackers on the computer frontier* Ballantine Books, New York

Hafner, K. and Lyon, M. 1996 *Where wizards stay up late: The origins of the Internet* Touchstone Books, New York

Johnson, S. 1997 *Interface culture: How new technology transforms the way we create and communicate* HarperEdge, San Francisco

Rushkoff, D. 1994 *Cyberia: Life in the trenches of hyperspace* Harper, San Francisco

Rushkoff, D. 1996 *Media virus: Hidden agendas in popular culture* 2nd ed Ballantine Books, New York

Stone, A. 1996 *The war of desire and technology at the close of the mechanical age* MIT Press, Cambridge, MA