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Using information and communication technologies in adult literacy education: New practices, new challenges

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An Adult **Literacy** National **Project** Report

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Publisher's note

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Glossary

In this report, we deliberately use a range of terms to talk about the use of information and communication technologies. The terms include electronic literacy, digital literacy, technological literacy, technoliteracy, multimodal literacies and multiliteracies. We do not argue that the terms are interchangeable, even though they are often used as if they are. All, however, have currency in the literature and in the print and electronic media. Just as the global context in which adult literacy education is located is dynamic and rapidly changing, so too is the language used to describe it. Rather than privilege a particular term, our aim is to suggest different ways to talk about the changes to literacy practices so that professional discussion and learning are facilitated.

Communication: With a range of common and technical meanings, communication involves interactions in which information is exchanged. Although it can assume many forms, most commonly, we identify communication with speech, but also with writing. In reality, most communication is multimodal—that is, operating via many channels at once. These include speech, writing, gesture, physical space, signs, tone, touch, dress, posture and a range of technologies. As a practice or a process, the term encompasses communication for information and ideas in print and electronic media. The term 'computer-mediated communication' is increasingly used to distinguish between print-based literacy and screen-based literacy practices.

Digital/technology-mediated or infused/technoliteracy practices: Changes to literacy practices are associated with the use of information and communication technologies. In an information and communication technology-mediated world, being literate is to do with understanding how the different modalities—word, image, sound—are combined in complex ways to create meaning. Acquiring digital literacy for internet use involves becoming proficient with a set of important skills.

Information and communication technologies (ICT): These include the diverse digital technologies available to people, such as networked computers, video games, the internet, mobile phones and DVD. All of these assume the centrality of the screen. The term signifies the so-called 'technology or information revolution': the shift of culture to computer-mediated forms of production, distribution and communication.

Multimodality: Signs, symbols, pictures, words and sounds combine in new ways in the electronic world to create meaning. The challenge for adult literacy educators is to understand how these multimodal formations create multimodal statements of greater and lesser complexity. What looks like the same multimedia text on paper or on screen is not functionally the same. It follows different meaning conventions and requires different skills for its successful use.

Key messages

Using a case study approach, this report examines the interaction between new and emerging digital technologies, adult learning and literacies for both educators and learners.

- The findings from this study suggest grounds for rethinking how to further adult literacy education and how it is labelled.
- The study illustrates that it makes little sense to continue to think and talk about literacy practices and the use of information and communication technologies as if they were separate activities: literacy education is equally and simultaneously digital literacy education.
- Adult literacy educators need to understand the new reality of contemporary communication so that they can produce learners who are prepared to contribute actively, critically and responsibly to a changing society that is mediated by the use of information and communication technologies.
- The case study analysis revealed that adult literacy learners need and want a broader technology curriculum than is currently available to them; in particular, they require information and communication technology 'lifeskills' such as online banking and internet searching information. Many adult literacy educators possess the skills and knowledge that their learners need. However, traditional institutionalised understandings of literacy often prevent the development of learning environments and delivery strategies to provide coherent integrated programs that encompass all literacies—old and new. Adult literacy programs that incorporate digital literacies need to take account of settings, contexts and purposes.
- Particular attention is required in the adult and community education sector, which is relatively poorly funded and therefore unlikely to be able to respond to the challenge of integrating the use of information and communication technologies in a timely and appropriate fashion. A coordinated, centralised assembling of resources for teaching and learning with these technologies would be invaluable.
- Because the term 'literacy' is strongly associated with the world of print, it has come to assume the stigma of failure and inadequacy. We need to rethink not only the work of technology-mediated adult literacy education, but also how it is labelled. 'Communication' could usefully replace the word 'literacy' in adult education programs. The advantage would be to focus attention on how the use of information and communication technologies is never divorced from wider communication practices, while at the same time remove the negative impact of the term 'literacy' and its close association with print.

Executive summary

Understanding more about adult learners' digital communication practices and the implications for adult literacy programs represents the fundamental purpose of this study. The research asked what the term 'literacy' will mean in the next decade. What new kinds of literacy practices will adult learners now entering Australia's literacy programs require for life-long learning? How will they gain the literacies essential to communication in the globally extended networks now integral to 21st century workplaces and communities? Are adult literacy educators, grounded by their education and values in the late age of print, prepared to work with these adult learners to help equip them with the new post-print literacies in productive ways? How might current curricula and pedagogy be modified to take account of learners who must become skilled not only at reading the pages of print texts, but also the texts of multimodal websites? How might adult literacy programs change to meet the needs of learners who must make meaning not only with words, but also with digitised fragments of video, sound, photographs, graphics and animation to support communication across conventional linguistic and geo-political borders? What are some useful approaches to professional development and learning that will help educators meet the challenges?

We took account of the literacy research that has theorised everyday literacy practices. We also examined the concentration of work in the area of digital literacy practices. Although little of this research has focused specifically on the adult sector, it is possible to draw on its insights. We then looked at recent research that has investigated the use of information and communication technologies (ICT) for literacy purposes in adult education.

To explore the research questions, we chose a case-study methodology. Five sites were selected to represent a range of adult literacy programs across three states. At each site, we interviewed older and younger educators and learners on two occasions. We also asked them to keep a diary of their technology-mediated literacy activities during the week between the interviews. Our questions focused on the participants' views, experiences and technology-mediated literacy practices in the formal education context, the workplace and the home.

The study produced some important findings that provide a basis for developing systematic, coherent and informed approaches to furthering adult literacy education in an age where literacy practices are increasingly mediated by the use of technologies. They suggest grounds for re-thinking the nature of the work as well as how it is labelled.

We do not claim that the study's findings are generalisable. However, we have aimed to present readers with carefully argued interpretations and claims, and adequate evidence to support them. As researchers, we have tried to provide the elaborate information with which readers can decide the extent to which the case studies are similar to, and thus likely to be illuminating about, their own situations. When the readers of this report 'apply' the findings to their own experience or to similar settings they know, they may then gain a better understanding of their own situations.

In exploring the relationship between adult literacy practices and the use of information and communication technologies, the research suggested that they are inextricably linked. By this we mean that it makes little sense to speak of the 'impact' of technology 'on' literacy. The association between literacy and technology is far more complex than a one-way, causal explanation might suggest.

Some of the educators preferred the term 'communication' rather than 'literacy' to describe their work with learners. They saw 'literacy' as not only strongly associated with the world of print, but also connected to the stigma of failure. With our cultural dependence on print increasingly being replaced by more complex information and communication technology-mediated literacies, the study suggested that it might be timely to rethink our use of the term 'literacy'. A self-conscious shift to 'communication' might serve to focus educators' attention on the multimodal textual practices intrinsic to screen-based reading and writing rather than on the practices associated with the world of print.

In identifying the new literacies required for effective and critical use of information and communication technologies in adult literacy education, the study found that they are multiple, that they are based around the integration of previously separate modes of communication, and that this integration is not well understood by adult literacy educators.

Most of the educators, who had superior expertise to the learners in a range of technoliteracy practices, used information and communication technologies in their programs to provide opportunities for learners to acquire discrete skills for academic or work purposes. They did not believe that everyday information and communication technology applications had a legitimate place in the classroom. The lived information and communication technology experiences of the learners, however, suggested the need for the inclusion of technology 'life skills' such as online banking and internet searching for information.

There was little evidence of attention being paid to the promotion of critical awareness for an informed use of technologies. There were hints of it in the indignation of learners and educators when things did not work, in the complaints about inadequate technical support as compared to more powerful groups within the institutions and community, and an emerging critical perspective amongst some students. But a systematic, integrated approach to critical technoliteracy was not reported at any of the sites.

The findings demonstrated that changes to pedagogical practices associated with the use of information and communication technologies in adult literacy programs are possible, as evidenced by several educators who were able to provide specific learning opportunities for some learners in targeted ways. The potential for further curriculum diversification and enrichment was also apparent across the sites. However, most of the participants told us that if technologies were to be integrated in thoughtful and productive ways, access to reliable, quality technology and the availability of resources to support the acquisition of digital literacies were essential.

The educators differed in their ability and willingness to use digital equipment. Most, however, had some needs for technical skills development. Most also described their own technical skills as self-taught and preferred to learn in this way, only seeking help when necessary. The availability of help, however, was not always present. In order for educators to facilitate the effective integration of the use of information and communication technologies into adult literacy education, concerted professional development activity is needed.

The study reached a number of important conclusions: the enduring value of human contact in educational settings needs to be preserved despite growing interest in the potential of online delivery; opportunities for teachers to consider how the use of information and communication technologies might be integrated into adult literacy education are essential; learners, who are already subject to multiple disadvantages, need access to technology-mediated literacy programs that are well resourced and staffed by educators who are confident and skilled users of information and communication technologies. Overall, there was sufficient coherence across the case-study sites to make a case for curriculum, pedagogical and program reform in adult literacy education.

In addition to this report, the study produced an extended literature review and more detailed descriptions of the case-study sites. The support document is available in *Using information and communication technologies in adult literacy education: New practices, new challengers—Support document* at: <http://www.ncver.edu.au>.

Introduction

With the advent of new information and communication technologies (ICT)—in particular, the internet—the literacy practices associated with their use are undergoing change at an unprecedented rate. The print paradigm has proved more resilient than some expected—for example, forecasts of the death of the book, or the wholesale replacement of face-to-face teaching and learning by online education, are already wide of the mark. Nevertheless, literacies, as dynamic systems of social and cultural practice, are being transformed simultaneously by technological change, electronic communication and the globalisation of knowledge.

Yet while there is widespread speculation, both optimistic and pessimistic, about the social and cultural consequences, there has been little systematic research to examine the changes, particularly in adult literacy education. Understanding more about digital communication practices and the implications for adult literacy represents the fundamental purpose of the study reported here.

In the context of the project, new literacy practices—*digital* literacy practices—are seen as more than encoding and decoding language. They comprise the ability to use and understand information in multiple formats from a range of sources, when it is presented via the electronic screens of digital technologies. Core literacies include internet searching, hypertextual navigation, content evaluation and knowledge assembly.

These new literacies are multiple and based around the integration of previously separate modes of communication. Understanding how meanings are made with these multimodal texts represents a key challenge for adult literacy educators and learners. In addition, learning how to operate the technologies efficiently and confidently, and developing a critical awareness of how electronic texts position readers and writers represent equally important challenges. To produce learners who are prepared to contribute actively, critically and responsibly to a changing society that is increasingly mediated by the use of information and communication technologies, adult literacy educators need to take account of the complex ways in which the use of these technologies influences, shapes, and even transforms, literacy practices.

Four research questions framed the project:

- ✧ What is the relationship between literacy practices and the use of information and communication technologies in adult literacy education?
- ✧ What are the new literacies required for effective and critical use of information and communication technologies in adult literacy education?
- ✧ What changes to pedagogical practices are associated with the use of information and communication technologies in adult literacy programs?
- ✧ What are the professional development needs of educators when information and communication technologies are used for teaching and learning in adult literacy programs?

To investigate the questions, a qualitative case-study methodology was chosen. Five sites, representing a range of adult literacy programs, across three states, were identified and the data collected over three months. The study was designed to develop new data on the adult literacy, information and communication technologies, new literacy practices nexus to inform curriculum and pedagogical directions in adult literacy programs. Specifically, the project was designed to produce the following outcomes: a review of the related theory and literature, case studies of contrasting adult literacy programs and a recommended approach to professional learning.

Literature review

We frame the review of the literature with some telling statistics (ABS 2003, 2004a). These data show significant increases in internet-sourced work across Australia in recent years, demonstrating the extent of workplace mediation by the use of new technologies. This is important because adult literacy education prepares people, both directly and indirectly, for the workforce. Overall, 83% of Australian businesses used a computer and 71% accessed the internet during 2003 (ABS 2004a). The percentage of households with computer access has also been growing, albeit relatively slowly, from 44% in 1998 to 61% when last counted in 2002 (ABS 2003).

The growth in both computer use and internet access is being driven mainly by growth in internet access at home. Between 1998 and 2002, the percentage of households with access to the internet at home rose from 16% to 46% (ABS 2003). In the context of the burgeoning entry of sophisticated communications technologies into the privacy of homes, it is likely that the blurring of the boundaries between work, education, training and the domestic sphere will continue to accelerate.

This review acknowledges these developments and restricts itself to a tight selection from our extensive reading and analysis of a 20-year period of theoretical, empirical and policy studies that have examined the relation between the use of information and communication technologies and literacy (especially adult literacy) education. The basis of the selection is the general framework of the present study: *new practices, new challenges*. Existing surveys of the literature are referenced to provide an anchoring in a broad chronology, but the bulk of the material presented is organised around emergent and promising practices and present and predictable key challenges. To begin, we present a brief outline of the approach to literacy that informs the study.

A social approach to literacy

Accounts of literacy have become increasingly complex. An early sign that changes were occurring emerged in the 1990s when the pluralisation of terminology related to social practices became commonplace (Street 2001; Baynham 2003). The term 'literacy' was replaced with 'literacies' in response to evidence that competence in reading and writing print materials did not automatically transfer to competence in other communication practices.

Accompanying the pluralisation of the term was the recognition that literacy practices are 'situated', meaning that they occur within social networks of communication. This understanding challenged the previously popular notion that they were the isolated skills of autonomous individuals (Barton, Hamilton & Ivanic 2000). Recent projects and research in adult literacy education reflect these understandings (Shore 2003; Flak & Millar 2001; Watson, Nicholson & Sharplin 2001).

Such explanations of literacy differ from the prevailing belief that literacy simply involves encoding and decoding verbal and written language. Because literacy is not a skill that is endlessly portable between domains and tasks, individuals have variable literacy capability: they have more in some literacy activities and less in others (Collins 1995). As a result, the old assumption that literacy is a singular skill, permanently available to those who gain it, is no longer tenable.

Instead, we know that different fields of knowledge, and different modes of communicating information, deploy their own internal literacy conventions. These particular literacies are not static over time, and literacy conventions are prone to rapid change, especially those associated with the

use of information and communication technologies. It follows that as different discipline areas have their different 'literacies', it is not only difficult but also unhelpful to separate 'literacy' from its field of knowledge and to teach it in a program of its own.

In addition to these observations about literacy practices, researchers and teachers concerned with the educational, occupational and citizenship consequences of literate capability often point out that literacy involves a critical disposition: an awareness of how texts position readers and writers (Fairclough 1995). Exercising informed citizenship, or participating in the consumerism of daily life, continually raises this challenge: the need to be critically aware that texts are not neutral and benign (cf Lonsdale & McCurry 2004).

Compounding these observations about the nature of literacy is the historically unprecedented impact of instantaneous electronic communications. Information and communication technologies are deeply dependent on literacy and each technology makes a unique demand on the literacy skills of users. Furthermore, over time the separate technologies which mediate the digital revolution converge with each other, and this process also has a major impact on what counts as literacy: mobile telephones, with voice and text transmission, increasingly carry images; and computers increasingly transmit combinations of images, moving and still, and allow users to operate a multitude of coding and accessing modes.

Previously separate systems are becoming combined so that different modes of communication and their meaning-making systems are now integrated into complex systems that depend on ever-more complex literacy practices. The intensification and rapidity of these developments make it practically impossible in some areas to distinguish the boundaries between literacy and technology so that we now talk about 'technoliteracy' (Lankshear & Snyder 2000). This fusion of contemporary communications produces multimodality as the emergent norm of literate practice, in which language, image, music, sound, texture and gesture, as well as other semiotic modes, diversify the meaning-making channels available to us.

Notwithstanding the considerable support offered by new media to individuals for whom verbal or print literacy was difficult, it is not surprising that individuals whose literacy capabilities varied significantly in relation to traditional literacies should vary even more in relation to the complicated demands associated with the use of literacies. Literacy and technology are so inextricably connected that failure to recognise the connection in adult literacy education is ultimately disadvantaging.

Noticing the technologies

As Bruce observes, we do not typically 'notice the technologies of literacy because we treat our literacy technologies as natural and inevitable' (Bruce 1998, p.47). Literacy, however, always involves some kind of technology. At any particular time and place, literacy is necessarily related to the technologies that are locally available, so that literacy and technology are interconnected. This means that written language is always technologised, only coming into being through the available technologies of information and communication. Some of these we do not often think of as technologies, such as marks or scratches made on natural surfaces, the alphabet itself, and other symbol systems, the stylus or pencil, the printing press, and, today, the 'digital-electronic apparatus' (Bigum & Green 1992; Snyder 1996). Such technologies, however, 'encode' language, making it possible to symbolise speech.

These insights also serve to emphasise some of the reflections about literacy presented earlier. If literacy is always changing, and is influenced by different contexts and applications, then it cannot be assumed that once acquired literacy will remain appropriate, and sufficient, to new settings, tasks and contexts. It follows that different learning tasks and technologies will contain or impose new and distinctive literacy demands on users, which will be best and most effectively taught in the context of using that new technology, or participating in the new tasks. From an historical perspective, it becomes clear that as technologies change, people apply and adapt existing literacy

skills in different ways to accommodate the changes. As with other social practices, successive advances in technology have extended the boundaries of the literacies that were previously possible and each technological advance provokes a corresponding change in how we practise literacy and understand its social role.

However, despite the emergence of these new ways of practising and thinking about literacy, literacy education remains much the same enterprise it has always been. Literacy education continues to involve students learning and using old skills, but applying them in new ways via new technologies and new media. The resources required for literate capability—cracking the code, participating in the meaning of texts, using texts functionally and analysing texts critically—are as important for literacy teaching under the influence of information and communication technologies as in less technology-intense teaching of literacy (Freebody & Luke 1990).

New challenges and old challenges in new forms

It is increasingly important to see that print is just one medium of literate practice within an entire range of available media. Further, these available media are not neutrally distributed. For centuries, print, and within the print mode, some types of writing, have predominated over others. This 'old' arrangement of the literacy forms is undergoing major transformation. Durrant and Green (2000) have described this transformation as a broad-based shift from print to digital-electronics as the organising context for literate-textual practice and for learning and teaching. This shift does not mean that the old modality, print, will be displaced. Indeed, the forecasting of the death of the book has been exaggerated. However, the traditional forms of print, the book and the letter, have been altered, and new textual forms have come into prominence. As a result, more flexible and expansive views of what constitutes literacy are required.

With the collapse of past divisions between modes of literacy and the contemporary integration of multiple modes of meaning making, including writing, moving images, sound, graphics and colour, new literacy practices are increasingly required. These changes to literacy practices have important implications for adult literacy education. Assessing achievement and learning in these new and dynamic literacies is a challenge already facing many educators today. Imparting a critical awareness of how these new and complex literacies position people—the economically disadvantaged, the elderly, the disabled, those with restricted access to the enabling technologies, those actually disadvantaged by the operating mechanisms of some new technologies, and marginalised and oppressed populations—is an even greater challenge.

Albrecht (2001) cautions that information and communication technologies and multimodal literacies depend still on a critical disposition, more so perhaps than with the print paradigm. An endemic aspect of the information age, in economic, social and political life, is not an absence or a shortage of available information to support decision making, but an excess of information. The key task becomes how to organise, interpret and manage this information. More and more, citizenship and public participation will require skills in resisting pervasive propaganda, relentless advertising, in being able to exercise judgement, and in locating relevant information, guided by appropriate frameworks of knowledge and wisdom.

Not surprisingly, perhaps, the research literature dealing with the use of information and communication technologies in literacy education increasingly identifies sharp challenges facing literacy teachers. These include the enduring educational and social issues of fair and reasonable access and equity, and opportunities for designing and shaping the future in the more complex context of technologies (Kress 1995), rather than only taking account of changing circumstances and conditions of literacy. In addition, technologised literacy, or more deeply technologised literacy, also represents a challenge, not merely in terms of how it affects people, but how wider segments of the population can be empowered to make productive use of the potential of the technologies. In the words of Schneiderman (1997, p.vii), it isn't just a matter of helping learners to 'surf the net but [to] make waves'.

Digital divide revisited

We know a lot about many different aspects of the intersections between literacy, learning and technology. Digital literacy practices have been studied extensively in general terms (see for example, Snyder 1997, 2002; Burbules & Callister 2000; Lankshear & Knobel 2003). Multimodal literacy has been explored from many angles, including its teaching implications (Cope & Kalantzis 2000). The variability of literacy has been examined internationally by researchers working under the umbrella term, the 'New Literacy Studies' (Gee 1996; Street 1993, 2003), greatly extending current understanding of how literacy operates in diverse social settings. While these formulations offer imaginative and empirical perspectives to enrich the understanding of the use of information and communication technologies in education, there remains a shortage of specific examinations of adult basic education. When issues of advantage and disadvantage are considered, it is usually under the banner of the term 'the digital divide'.

Warschauer's (2003) thinking about the digital divide is of particular relevance to adult education. He identifies a kind of literacy that he calls 'computer-mediated communication literacy'. Warschauer defines it as the capability of creating, managing and participating in online communication using a diverse range of formats and genres. This literacy dissipates the temporal separation typical of writing, in which a written text is not 'consumed' immediately, as is speech, but is read and consumed later. Chat groups are an example in which the disparity between the speech paradigm, in which there is a high degree of interactivity and shared meaning making, and writing, in which there is more distance and less immediate interaction, is collapsing. Given that many people use the internet for chatting and 'cyber shopping', it is possible to see that technology usage does not necessarily require reading to any great extent.

Although technology shapes how we practise literacy, argues Warschauer (2003), it remains the case that literacy can act as a gatekeeper for accessing technology and using it fully. For Warschauer, the famous digital divide is less a kind of division between access to computers or lack of access to computers. According to his analysis of advantage/disadvantage, the digital divide is not so much a hardware and access question as a literacy question. It represents a division between differential access to the range and depth of semiotic tools to use fully and productively the resources and power of online and technology-mediated knowledge. Lacking these tools results in only 'pre-packaged' menu alternatives being available. Variations in ability to make maximum use of technologies are essentially literacy issues.

In developed countries, information and communication technology access and usage, especially to internet resources and power, is segmented according to socio-economic status, income, gender, education level, age, geography and ethnicity (Warschauer 2003). Disadvantaged social groups are not only less likely to use such technologies, but also disparities in access are increasing, and, more importantly, the ability to use available computing is significantly unequal. The consequence is that even if access can be improved, it is unlikely that the divide will be lessened because the literacies required for productive and maximal use are not being made widely available.

Using information and communication technologies in literacy learning

An important contribution to the literature is Andrews' (2004) systematic analysis of the relation between information and communication technologies and literacy. Despite its focus on the compulsory school years rather than adults, and its concern with the *impact* of technology *on* literacy learning, which represents a limited way of looking at a complex relationship, this survey traverses some similar territory to the considerations of the present report. As a result, it offers

helpful reflection on the coming together of the domains of information and communication technologies and education. The review concentrates on five areas:

- ✧ the relation between information and communication technologies, literacy learning and learners whose first language is not English
- ✧ the impact of information and communication technologies on reading and literature in general
- ✧ the relation between information and communication technologies and the moving image
- ✧ outcomes evidence on the effectiveness of the use of information and communication technologies in literacy learning programs predominantly drawn from experimental studies
- ✧ the specific impact of 'networked information and communication technologies' on literacy learning.

Andrews' analysis of the learning effects of applying information and communication technologies in literacy teaching concludes with a mixed set of findings. A number, however, have particular significance for our study. For some learners, technologies bring no improvement in educational outcomes. Given the prevailing public policy expectation that the use of information and communication technologies leads to enhancements in the quality of educational outcomes for both adult and child learners, it will require a new mindset to view the relentless advance of these technologies as not necessarily improving educational outcomes in its wake.

Even more remarkable, Andrews concludes that in some instances educational practices and learning are made worse. The sense that often prevails among those with strong enthusiasm for technology is that teaching can more closely target the needs of individual learners, that curriculum can be diversified and enriched, and that different teaching styles can be catered for. Andrews' survey provides an important corrective to excessive technological optimism.

As a caution against unthinking confidence in the promise of technology, Andrews proposes that randomised trials should precede further investments in information and communication technologies for literacy education, and that policymakers and literacy teachers should be alerted to the reality that non-technological methods are, at the very least, as effective as technology-infused teaching in promoting literacy learning.

However, Andrews' belief that 'rigorously designed' randomised trials evaluating the impact of information and communication technologies on literacy learning across all age groups will attach 'scientific' evidence to direct future policy settings may be too hopeful. It is just as likely that systematic research evidence may be unable to assist in resolving choices around public investment given that fraught issues of public policy—such as the degree of investment required by public authorities in technology-mediated literacy education—are rarely amenable to resolution through research.

When summarising the studies that have investigated the relation between information and communication technologies and moving images, Andrews (2004) reports several empirical studies that suggest a beneficial effect on print literacy of engagement with digital moving media. A number of these studies contribute to theory building about multimodality. He points out that engagement with the moving image is relevant to both writing and reading. He also finds that such engagement necessitates a more vigorous style of teaching than mere investments in hardware or software.

In addition, Andrews' review finds that information and communication technologies can affect positively social interaction among learners in the context of literature-related literacies, but probably because the use of these technologies is mediated by teachers. A similar conclusion is reached in connection with learners of English as a second language. For these learners, English literacy acquisition was enhanced when the information and communication technologies had a specific and identifiable pedagogical function, rather than a random application. The overall conclusion—that teachers are more important as facilitators 'under the influence' of information and communication technologies than without them—may not be generalisable, but it coincides

with the findings of our study and lends weight to the observations of teachers in Australian adult literacy programs.

As far as specific technologies are concerned, Andrews (2004) reports that speech synthesis and word-processing functions of information and communication technologies have had the most positive consequences for literacy teaching, that computer assisted language learning typically supports more code centred and lower levels of literacy development best, and that non-technology-mediated educational practices are in no way inferior to technology-based or technology-influenced literacy teaching. However, because there are few non-technology-using classrooms to compare with technology-mediated teaching, experimental research designs provide little practical guidance to educational improvements.

Despite some reservations, Andrews' (2004) comprehensive and thorough review is useful. In keeping with Andrews' study, the present project is informed by the understanding that the use of information and communication technologies, in and of itself, is unlikely to produce significant educational enhancements in literacy acquisition. It is also informed by the understanding that experimental research designs do not capture the complex, interactive and iterative character of literacy learning and teaching. A carefully designed qualitative approach with quantitative dimensions—in other words, a mixed-method approach—is more likely to provide an appropriately nuanced picture of what happens when information and communication technologies are used in adult literacy education.

From New Zealand, Parr's (2003) review of the research literature on computer-assisted language learning (CALL) is also useful, providing a broadly congruent adjunct to Andrews' (2004) more substantive study. Commissioned by the Ministry of Education, the review focuses on learning outcomes. Parr concludes that learning cannot be demonstrated irrefutably and, indeed, that computer-assisted language learning is generally accompanied by lingering mastery acquisition theories of learning. These include some approaches that recall rather narrowly focused psychologically oriented practices, sometimes reintroducing superseded literacy teaching techniques into classrooms in which non-technology-based teaching had progressed to more inquiry-oriented pedagogies. Parr finds that in New Zealand primary school classrooms, the practices of teaching reading favoured by learning software are widely discrepant from accepted classroom pedagogies and generally lead to inferior learning outcomes. The one area where more positive outcomes were found was in mathematics, though it appears that enhanced procedural knowledge was unlikely to be generalised to school or system-wide curriculum assessments.

And from Spain's Canary Islands, but linked via European Union funding to Scandinavian research, the Virtual Network for Adult Education (RedVEDA) reviews the integration of internet resources in adult school settings (Area 2002). Involved in training 43 teachers to use new technologies, the network produced 15 different sets of multimedia materials for adults, trained teachers in the use of digital resources for adult education, and designed and managed a project website. The project is interesting because in the context of the Canary Islands, even as late as 1999, there was no previous experience in the use of internet resources and online courses in adult education, whereas the Swedish and Finnish partners were relatively well versed in these areas. Despite achieving many of its aims, the project has faltered.

These two studies, from New Zealand and the Canary Islands, serve to strengthen the point that technologies reflect and follow human demand, interest and propensity as much as they drive them. To fully appreciate the changes that the use of information and communication technologies introduces into adult education systems, and to assist in spreading competence in the management of the literacies that govern their use, social and cultural analysis as much as technical mastery is required. Accordingly, we paraphrase Locke and Andrews' (2004) questions about information and communication technologies and literacy:

- How best can educators utilise information and communication technologies to achieve teaching/learning objectives that are socially and culturally empowering?

- ✧ If information and communication technologies are changing the nature of literacy, how can control, mastery and pedagogy attached to the new literacies be incorporated into classroom teaching?

A brief chronology of research is useful, if only to remind researchers, policy makers and practitioners to be cautious about ensuring that past failed practices are not repeated. During the late 1970s and 1980s, researchers conducted examinations of classrooms aiming to control naturally occurring social and cultural variation and isolate the influence of information and communication technologies on learning. It is fair to conclude that many researchers came to recognise that such control is not ultimately possible: a common outcome of attempts to produce 'laboratory' like conditions is to generate 'results' that are trivial or non-transferable (Snyder 2000).

New directions

Recent work in the area of adult literacy and the use of information and communication technologies presents a range of important understandings and insights. In the Australian context, Miller and Falk (2000) investigated how literacy can be best provided for groups with special needs. Addressing the learning requirements of older rural Tasmanians, Miller and Falk studied the potential of online technologies 'to foster local literacies and community well-being', finding that access to online technology materially assists ageing rural communities to deal with deep social and economic transition. In communities with a declining economic base, with age profiles depleted due to out-migration of young people, and struggling to retain a semblance of productive economic life, enhanced access to and use of the internet can bolster community sustainability, provide needed training, and initiate lifelong learning practices.

Farrell and Holkner (2003) argue that more and more workplaces are no longer 'places' as such, preferring to call them 'hybridised workplaces'. Made possible by the use of technologies, these new workplaces operate according to non-geographic principles, connecting participants via networks. The researchers examine the effects such workplaces have on the use of language and literacy amongst employees and identify the vulnerability of texts to become lost or misinterpreted as each individual cultivates individual communication norms and is selectively dependent on different technologies. The researchers suggest that literacy education should aim to build communities of shared understanding when new technologies are used so that the erosion of workplace communication due to the effects of information and communication technologies is ameliorated.

In a similar vein, but focusing on a different dimension of literacy, Waterhouse and Virgona (2004) specifically address the vocational education and training (VET) system in Australia: the use of literacy in aged-care facilities and call centres. This study highlights some very effective training but cautions that there is a temptation to limit the literacy and generic skills taught to those applicable in particular workplace settings. For Waterhouse and Virgona, this would be counter-productive, since the workplace literacies are narrower than those required in wider society and such targeted literacy teaching has been found in the past to be ineffective in enhancing literacy functioning.

Peters and Lloyd (2003) investigate demand for online VET delivery and the key factors that influence how this demand is manifested and determine its characteristics. Students undertaking training to enhance, or change, careers or generally to improve their skills, and people who are self-employed are the categories most likely to favour the delivery of training by online means. The strong association of demand for online education delivery with career-specific goals should not be confounded with a narrowing of literacy teaching to support such online learning. This caution emerges from all of the previously reviewed studies.

Although it focuses on K-12—a major study of more than two decades of public policy on the use of information and communication technologies in education, conducted for the Department of Education in the United States of America—it has implications for education broadly conceived, including the adult sector (Culp, Honey & Mandinach 2003). The analysis of key policy reports

over the critical period of accelerating technological change, the mid-1980s to the present, addresses the integration and application of technology in education.

A very early but decisive US policy document, the 1983 report, *A Nation at Risk,* by the National Commission on Excellence in Education, established a solid platform of including social and communication issues within thinking about technology. The report envisaged that all high school graduates should understand computers as 'information, computation and communication' devices and that they should learn to use the computer as a tool for 'personal and work-related' purposes. This represented an expansive approach to the use of information and communication technologies in educational contexts, in contrast to the tendency for reductionism in the scope and purposes of computer-related learning. The report connects technical and technology aims closely to communication and community-based objectives. The report also recommended that learners 'understand the world of computers, electronics, and related technologies', anticipating a critical approach to the consequences of technology in society as a likely future direction in technology-mediated literacy education.

Culp, Honey and Mandinach (2003) also address the most recent major report in general education, the American *No Child Left Behind Act of 2001* (Elementary and Secondary Education Act 2001). This Act advocates that all eighth graders should be technologically literate, emphasising the importance of general educational technology for all levels and aspects of schooling. It constitutes technological literacy as 'a basic', but without the breadth of *A nation at risk*, the Act has adopted a more instrumental view of the relation between education, literacy and literacies. Culp, Honey and Mandinach also cite *Partnership for 21st Century Skills* (2003), which supports and extends the *No Child Left Behind* precepts about technological literacy. New directions in information and communication technologies and literacy, however, are more widely based in *Partnership for 21st Century Skills*, vindicating the direction of *A Nation at Risk*.

A recurring theme of the US policy reports on technology is the emphasis on the economic and social transformations that have made technology skills central to the future employment of today's students and, more broadly, to the importance of technological innovation in maintaining the global dominance of the United States (Culp, Honey & Mandinach 2003). Continuing in this vein, *Learning for the 21st Century* is drawn from the stable of projects under *Partnership for 21st Century Skills* (2003). Reiterated in this report are the impact of technology on the job market, the flow of information and resources in a global marketplace, and the impact of digital technologies on daily life. In the context of the overwhelming emphasis in such documents on the nexus between the labour market and technology, and US competitiveness in a global market, it is useful to keep in mind the cautions about equitable access to the promoted technologies, and their associated literacies, and the presently unequal nature of access to, and capability of using, information and communication technologies in either education or labour market activity (Selfe 1999).

Policy documents repeatedly connect the specific capabilities of various technologies with recurring challenges to the delivery, management, and support of effective teaching and learning experiences. Frequently mentioned are the delivery of instruction to geographically dispersed educational clienteles; helping students gather and interpret complex sets of data for project-based investigative learning; supporting enriched, diversified and process-oriented writing projects and communication tasks; and broadening the scope and timeliness of information resources available in the classroom.

Many reports contain strong assertions that technology can catalyse much needed changes in the content, methods, and overall quality of pedagogical processes, stimulating reform to lecture-driven instruction and encouraging its replacement with reflective, inquiry-oriented practices. Many but by no means all of these and other claims made for technology in policy documents are justified, but not all would qualify as 'new directions'. Some claims, especially the last, are doubtful, given that technologies can serve to stifle innovation, or return to some superseded practices in classrooms (cf Parr 2003; Andrews 2004). Nevertheless, it remains true that the use of information and communication technologies and literacy are bound together, as writing and technology have always been, and that deep changes in what counts as literacy are increasingly being brought about by the

converging technologies of instantaneous communications and these developments have a direct and major bearing on adult literacy education in Australia.

The paradox of different constructions of literacy

Literacy researchers and practitioners typically understand literacy as a situated and variable social practice. Paradoxically, policy makers and many in the wider public understand literacy as discrete and basic skills, testable, measurable and transferable from one context to another. The disparity between these characterisations results in a widening gap between policy understandings of desirable literacy teaching and researcher–practitioner understandings of desirable literacy teaching.

One outcome of this drift of understanding between researchers–teachers on the one hand and policy makers on the other has been a narrowing of the range of topics for research that are funded and the privileging of quantitative methodologies for new commissioned studies. Another outcome has been a demand in policy for greater accountability and more measurement of outcomes, using norm-referenced assessments.

The connection between evidence of literacy difficulties among the population and the provision of funding for teaching, research, and curriculum development is far from straightforward (Lo Bianco 1996; Lo Bianco & Freebody 2001). Research on the effects of acquiring literacy skills is also ambiguous. Many individuals with low levels of literacy function effectively in society and employment and pursue full and active lives. Further, ethnographers of literacy have shown that literacy does not necessarily have the cognitive consequences nor the economic and social pay-offs that are often claimed for it. However, without such evidence, it becomes more difficult for literacy advocates to persuade politicians, and independent funding authorities, to invest in basic education and literacy. It is also clear that the stigma that attaches to poor literacy skills is a major and persisting one. The use of information and communication technologies is similarly complex in the gap between the various understandings of its role in personal lives and economic/citizenship opportunities.

What is clear is that the specific examples of disadvantage and inequality that result from poor literacy, and low technological literacy, are many but not universal, are serious but not for all people disabling. What is important is for research, teaching and policy to address not generalisations and abstractions in these areas, but to focus on specific settings, contexts and purposes for embarking on enhanced literacy/technology programs, to provide professional development support for teachers, and to research appropriately the site-specific needs for literacy, information and communication technologies and education articulated with the wider social setting.

‘Communication’ rather than ‘literacy’ practices

This literature review has found that the emergence of new information and communication technologies carries significant implications for literacy practices. Recent Australian research strongly endorses this claim, arguing that a new communication order is emerging (Snyder 1997; Lankshear & Snyder 2000; Snyder 2001). These writers also point out that within this dramatically changed communication paradigm the term ‘literacy’ is less and less useful. This is because literacy is often inscribed with reductive and narrow meanings (Snyder 2001) and, possibly worse, carries a baggage of serious social stigma for those with poor literacy. Both policy makers and teachers need to accommodate the increasingly blurred boundaries between different areas of knowledge and different theoretical perspectives: to regard ‘literacy and technology studies’ and ‘media studies’ as separate enterprises may no longer be tenable.

It may be appropriate and timely to abandon the notion of ‘literacy practices’ and substitute ‘communication practices’. The term ‘communication practices’ avoids the negative stigma associated with low levels of literacy, evident from considerable research, and from the case studies discussed later, and could serve to avert reductive notions of literacy. The term ‘communication

practices' might also serve to undermine the overly close association between literacy and the printed word and focus attention on the need for enhancing understanding of multimodal communication practices intrinsic to a future likely to be dominated by screen-based reading and writing practices, rather than print-based ones.

Design and methodology

The study was designed to investigate the implications for adult literacy education of the changing communication practices associated with the use of literacies. Four research questions were formulated:

- What is the relationship between literacy practices and the use of information and communication technologies in adult literacy education?
- What are the new literacies required for effective and critical use of information and communication technologies in adult literacy education?
- What changes to pedagogical practices are associated with the use of information and communication technologies in adult literacy programs?
- What are the professional development needs of educators when information and communication technologies are used for teaching and learning in adult literacy programs?

In establishing a methodology to explore these questions, we were concerned to balance three requirements: the need to produce reliable results that have validity in Australia's diverse adult literacy programs; our desire to obtain rich data; and the necessity to conduct the research within the constraints of time and money.

With these needs guiding our decisions, the research was constructed as case studies (Yin 1994; Stake 1995) of five adult literacy programs in which information and communication technologies were used. The study was committed to a design that was essentially qualitative, but also included quantitative data sources. Our aim was to describe and analyse the technology-mediated literacy practices of the participants at each site, at one point in time (Barton & Hamilton 1998). As case-study researchers, we favoured a personal capture of the adult literacy experience so that we could interpret it, recognise its contexts, puzzle over the many meanings, and 'pass along an experiential, naturalistic account for readers to participate themselves in some similar reflection' (Stake 1995, p.44).

In each case study, the focus was on the two groups involved in the literacy program: the educators and the learners. Attention was given to the participants' views, experiences and technology-mediated literacy practices across three domains: the formal education context, the workplace and the home. As our reading of the literature suggested that the relation between age and the take-up of information and communication technologies requires further investigation, we took advantage of the opportunity to examine age as a factor, while recognising that age is just one of a number of factors that influences the use of technologies in adult literacy. Age 40 was selected as the dividing line to assign learners and educators to one of two categories: 'older' and 'younger'. This decision was not arbitrary; rather, it was pragmatic and sensible within the study's context. Thus at each site, educators and learners over 40 and educators and learners under 40 participated in the study.

Case-study sites

As the Australian adult literacy education sector is diverse, the selection of 'typical' case-study sites for a small qualitative study was difficult. It was important that the cases be representative rather than exceptional: that they be cases of *something*. We also wanted them to provide both 'particularity' and

'some sense of generality' (Walton, 1992, p.121). According to the Australian National Training Authority (ANTA) website, in 2001 there were over 4000 registered training organisations (organisations that provide VET services and issue qualifications), including technical and further education (TAFE) institutes, private training and assessment organisations, enterprises, universities, schools and adult education providers (ANTA 2001). The five sites selected for this study were chosen to represent as much of this diversity as possible.

The case-study sites were chosen from a range of registered training organisations across three states and territories: Victoria, South Australia and the Australian Capital Territory. The choice ensured a mix of metropolitan and regional locations. The sites included two large public registered training organisations, an enterprise-based registered training organisation and two community providers. One of the community provider sites had an Indigenous education program. Although many providers have Indigenous students, we were interested in what we might learn by examining a dedicated Indigenous program.

We need to point out that while the selection of the sites reflected the diversity of adult literacy programs, the sample size would not support the disaggregation of data on a site-by-site basis. Further, similar constraints to those that guided the choice of methodology also affected the choice of case-study sites: we made every effort to include a range of sites, but we were necessarily pragmatic in our choices.

Table 1 presents a summary of the sites. To comply with ethical research practice, the names of the adult literacy providers have been changed and the states in which they are located are not revealed. In at least one case, the name of the state might have indicated the case-study site.

Table 1: Case-study sites

Case-study sites	Type of RTO	Regional or metropolitan
Sturt Institute of TAFE	Large public RTO	Metropolitan
Wentworth Institute of TAFE: Adult Basic Literacy and Access Education	Large public RTO	Metropolitan
Extractive Industries Workplace English Language and Literacy (WELL)	Enterprise-based RTO	Regional
Hume University Indigenous Learning Centre	Community provider	Metropolitan (urban fringe)
Mitchell ACE	Community provider	Regional

Note: RTO = registered training organisation; ACE = adult and community education.

Data collection

In accordance with university ethics requirements, an application was made to the Monash University Standing Committee on Ethics in Research Involving Humans and permission was granted to carry out the study. As Indigenous participants were involved, the application also needed approval by the Centre for Australian and Indigenous Studies at Monash, which was given. In compliance with ethical research practice, just as pseudonyms were used to disguise the names and location of the providers, pseudonyms were also used to disguise the identities of the participants.

Data collection took place over a period of three months. In each case study, we sought to interview two educators (one aged under 40 and one over 40) and two groups of learners (one group with participants aged under 40 and one group over 40). However, as the case-study portraits show, our categories did not always match the availability of either learners or educators and it was sometimes necessary to interview the younger and older learners together.

The interviews, both individual and group, were semi-structured, but included core questions that reflected our reading of the theoretical, policy and empirical studies represented in the literature review. They were designed to generate information about a broad range of topics related to the participants' use of technologies, and incorporated prompts and probing questions (Denzin &

Lincoln 2000; Freebody 2003). The participants were asked about their information and communication technology biography—to describe their history in learning, work and leisure. Further questions focused on current use and practices: at work and at home; institutional and domestic support and constraints; and suggestions for improved practice and support. The interviews were recorded and transcribed immediately.

During the first interview, the educators and the learners at each site were invited to keep a diary for one week of their technology-mediated literacy practices: in teaching and in learning; at work and at home. They were asked to record the technology they used, for what purposes, how often, and the kinds of communication practices in which they engaged. Arrangements were made for follow-up interviews: the next week, wherever possible, but, in several instances, after two weeks. As potentially personal details might have been recorded in the diaries by the participants, we respected the codes of ethical research practice by scrupulously ensuring the confidentiality we had promised participants, both in the follow-up interviews and in our report of the data analysis. Further, the study design acknowledged the paradox inherent in using a written diary given that the facility of some respondents with print literacy may not have been as developed as their facility with other modes. An equally generative alternative, however, was not apparent. The diary is included in appendix A.

The interview and journal data were scrutinised in the intervening week(s) to reach tentative judgments about the range, nature, and frequency of the participants' technology-mediated practices. This enabled the researchers to formulate preliminary judgments about the participants' technology-mediated practices to discuss with them in the follow-up interviews.

After the second set of interviews, the data were coded and analysed thematically. The interpretative work that followed was informed directly by the literature review. The decision was made not to use qualitative software such as QSR Nud*ist or NVivo as the data sets were not large. Conventional modes of systematic annotation and coding of texts to identify patterns and trends were employed.

When a draft of the report was prepared, the findings were discussed with the members of the Advisory Panel. The aim was to 'test' the 'trustworthiness' and the 'communicative validity' of the tentative findings—to see if they rang true for professionals with knowledge and experience in the area (Lankshear & Knobel 2004, p.363). As our data were derived from only two sources—the interviews and the diaries—that final discussion enabled us to interrogate our preliminary findings and conclusions. This variation on the practice of triangulation was aimed to prevent us from accepting too readily the soundness of our initial impressions (LeCompte & Schensul 1999). If we relied on an initial interpretation, our findings might be limited and possibly misleading.

The data we collected from the educator and learner diaries represent the quantitative component of the study. The results were tabulated and are included in the next section in which we present the findings of the study.

The generalisability of the findings

Rather than trying to make claims about the extent to which the study's findings are applicable beyond the population studied, we find Lankshear and Knobel's (2004, p.363) notions of 'trustworthiness' and 'communicative validity' more useful, as they represent alternative approaches for readers to evaluate the quality of studies. 'Communicative validity' is concerned with judging the quality of the research process, including interpretations and claims made in the research report. The ideal of communicative validity is to present readers with carefully argued interpretations and claims, and adequate evidence to support them. It is not interested in making claims for the generalisability of the findings and interpretations. Communicative validity emerges from the interaction between readers and the reported research. Determining the 'validity' of a study is based on the soundness of the argument 'communicated' in the research report and the evidence used to support these claims.

As researchers, we have tried to provide the elaborate information with which readers can decide the extent to which the case studies are similar to, and thus likely to be illuminating about, their own situations. If the readers of this report 'generalise' the findings to their own experience or to similar settings they have known, then they may gain a better understanding of their own situation (Stake 1995). And even if readers decide that the sites studied were not 'typical', understanding can often be enhanced by examining the 'atypical'. The atypical can alert us to events or practices that are regularly overlooked.

Advisory panel

The project was guided by a small panel of 'expert' advisers which met on three occasions, with some members participating via telephone and email. Members provided advice and guidance to the research team on the research methods. As already mentioned, they also reviewed drafts of the report, offering constructive critique (see appendix B for the membership of the reference group).

Key findings

The report of our findings comprises four elements: portraits of the five case-study sites, a summary of the participants' digital literacy practices over a week, the analysis of the case-study data in response to the four research questions and one additional point. We begin with an introduction to the case-study sites.

The case studies

How we selected the sites has already been explained, as has the decision to use pseudonyms for the names of the sites and of the participants to comply with ethical research practice. In addition, details that might facilitate recognition of the providers have also been disguised. At each site, adults were engaged in basic literacy and numeracy education; however, the sites varied in geographical location, size, organisational structure, funding and governance. The data gathered at the five sites justify the selection. The data are rich and generative, and they support vigorous interpretations of educators' and adult learners' digital literacy practices in adult literacy programs.

Sturt Institute of TAFE is a large institute, located in an inner urban setting. The area is economically and socially disadvantaged. Wentworth Institute of Technology is also a large institute and one which historically has been better resourced than most other Australian TAFE institutes. It was selected as a case-study site because of its location within an affluent and highly educated community. The Extractive Industries WELL program was selected as an example of an enterprise-based adult access program in a regional location. The program is provided for quarry industry employees and is supported by the Quarrying Industry Association. Learners are employed in quarries throughout the south-east of the state and travel to classes scheduled at different quarry sites on different dates. Hume University's Indigenous Learning Centre is located on the fringe of a major city about 40 kilometres from the central business district. This university campus was developed to serve its local urban and rural communities, including a large Indigenous community. A group of Indigenous learners and their educators agreed to participate as a case study. Mitchell ACE is an adult and community education provider in a regional town. This case-study site was selected to represent ACE provision and regional learners and educators.

The demographic characteristics, resources, pedagogical culture and digital literacy practices for each site are discussed in the portraits that follow. On the basis of these detailed case studies, we were then able to identify the key findings of the research as they related to the four research questions.

Case 1: Sturt Institute of TAFE

The first case study was conducted in a metropolitan public institution. Despite its new buildings, this training provider serves an economically depressed area. The 2001 Australian census data underscore indicators of low education attainments and occupational status reinforced by an average family income of only $760 per week, well under the national average (ABS 2004b). The number of individuals with access to a computer at home was 32% compared with the Australian 2002 average of 61%.

Two groups of learners were interviewed: all the students in the younger group were under 18, which provided an important counterpoint to the group of older participants. Three educators—

Mary, Joanne and Bill—were also interviewed. Here, as at several other sites, additional educators were interviewed at their request.

Mary, an experienced, committed teacher and a self-taught 'early adapter' of information and communication technologies, reported a heightened receptivity among learners to acquiring technical skills, which she attributed to the ubiquity of the technologies: 'Everyone is exposed to it at some point, whether it's going to a Myer centre and just doing a touch screen to access different levels'. Basic confidence with information and communication technologies, said Mary, is required by all, as the rapidity of change makes some knowledge redundant and the continuous acquisition of new skills essential. Mary believed that information and communication technologies are critical with some learners, for whom technologies can compensate for lack of fine motor skills.

Joanne, originally a primary school teacher, had been involved in community literacy programs for 18 years, establishing remote area programs and working with adults suffering mental health problems. Largely self-taught with information and communication technologies, Joanne described their benefits: 'I think if we can offer as many different types of mediums for students to learn with, that is a far better way for us to go because different students respond to different things'.

Bill first used information and communication technologies in the automotive industry: 'I was using … computer databases very early, so coming to TAFE and having no computers was a bit of a strange one'. Industry consulting work led to an awareness of the literacy needs of adults in the workplace who couldn't read and write.

Joanne and Bill often team-taught 'high needs' classes with volunteer support. They said the institute was 'very positive' about information and communication technologies, but not attentive to the poor quality of computing available for adult literacy learners. Inadequate maintenance and repair, given the high usage and the beginning levels of many of the learners, were regarded as responsible for the less than optimum conditions. They cited several management practices and assumptions as inappropriate for their 'fragile' low-literacy group of adult learners: constantly changing institutional passwords; inadequate public library computer access where staff rarely have technology expertise; and inadequate planning for re-licensing of software so that teachers don't get training in replacement systems. And although the high quality of the printed results of internet-researched work could be rewarding and motivating, learners with low word literacy found on-screen reading difficult.

The three educators agreed that the coordination of resources for teaching with information and communication technologies would be invaluable. Their lack of availability was described as a 'frustration', since it required the endless invention of resources rather than building on existing ones.

The early school leavers group at this site—Michael, Joe, Mark, Martina and Emily—were enrolled in a 'vocational access' program at Year 10 level. They appeared more affluent than many of our other case-study learner participants and spoke confidently of their information and communication technology experiences, the prevalence of computing in most employment, and their private access to, and sophisticated understanding of, these technologies in general.

The second group comprised four adult learners and was more 'typical' of learners in adult literacy classes. The participants were Megan, a single mother with three children, including a severely physically disabled teenager; Caroline, who had several disabilities, including partial sight; Mike, disabled in a car accident; and Jim, single and unemployed. All except Megan were under 40 years of age. For this group, poverty, deprivation and personal problems significantly disrupted their access to information and communication technologies, which created many obstacles and annoyances in their lives. The cost of a computer, a mobile phone, landline internet access and regular payments to an internet service provider overwhelmed their resources. Up-to-date technologies, however, could have enhanced their quality of life.

Mike's disabilities, for example, made speech difficult. He found it easier to communicate via computer or text messaging, but was hamstrung by an old phone, a superseded computer, and no

home access to the internet. Megan had had a struggle to participate in the world of information and communication technologies as a sole parent with three dependent children, one of them severely disabled, on a low income and no job. Supportive teaching staff and the resources of the local library combined to allow Megan computer access and enabled her to begin study on the one day when respite care was available. As a result, she had taken her first steps in word-processing, internet banking, and text messaging. Caroline had a special disadvantage, commonly encountered by disabled adults on the wrong side of the 'digital divide'. Because she 'can't see very well', screen reading at ATMs was difficult, costing her money if she made mistakes, or loss of independence if she needed the services of a teller.

The use of information and communication technologies brings new sets of literacy demands. These learners at Sturt related instances of difficulty with long number codes required for mobile phone charge cards, with technical manuals and with complex online instructions, as well as with the sight, hearing and numeracy expectations of the material dimension of various technology appliances. Their stories are a sober reminder that economic deprivation has an impact, in concrete and sometimes unpredictable ways, on the lived experience of information and communication technologies as much as the education, training or employment-related needs for technical skills and knowledge.

Case 2: Wentworth Institute

Unlike the deprived surroundings of the first case study, the second site was located in an affluent and highly educated community. It is an institute of TAFE, a large public registered training provider, servicing a community where, according to Australian Bureau of Statistics (ABS) figures in 2002, 78% of households had access to a home computer and 60% to the internet at home (ABS 2003). In 2002 more residents paid bills over the internet (25%) and shopped online (22%) than in any part of Australia. Facilities at the institute reflected the community affluence: more plentiful, more up-to-date and better maintained than those seen at any of the other case-study sites.

The participating teachers, Katrina and Jillian, were early adapters of technologies: 'There was only one computer in the department and it was a security risk to leave it there over Christmas so I took it home'. Katrina and Jillian used a greater variety of technologies than other participants—not only professionally, but also in their private lives, including funds transfers, digital cameras, newsgroups, email lists—and eloquently articulated the place of information and communication technologies in adult literacy education: 'We really focus on computing as a necessary part of student learning'.

The teachers were conscious of the changes to literacy practices associated with the use of information and communication technologies and gave many examples of improved teaching, more rapid development of teaching materials and enhanced quality of resources produced. They decried those who unthinkingly use technologies simply because they are there: 'Oh we have to put something on WebCT. They don't care what it is as long as we put something up'. Compared with other providers, these staff had had plentiful access to relevant professional development.

Jillian and Katrina acknowledged a double deprivation for learners without familiarity with information and communication technologies: 'They're illiterate in the new literacy and … it's a different way of looking at things' (Katrina). 'I think that they need to be computer literate just to be part of society … just as we teach them literacy and numeracy so that they can survive in our world' (Jillian). These teachers were well aware of the usefulness of information and communication technologies for addressing the needs of learners with particular disabilities, as with one of their students who has arthritis: 'Her fingers don't work really well. It's easier for her to write that way and get it from here to there than using the pencil' (Katrina), while disabilities might in fact exclude some learners—such as 'sight impaired students [who] can't see the screen' (Jillian)—from access to technologies.

The rapidity of change in the world of information and communication technologies was further evidenced here, where, partly because of the advanced resources available to teachers, awareness of what improvements or refinements were available appeared greater. For example, they expressed a

desire for increased server space to permit more elaborate resource and multimedia production, and specialised computers for learners with physical disabilities. For learners, the 'wish list' was simpler and similar to that expressed at other case-study sites: 'I haven't got a computer; wish I did; can't afford one' (John). Even in relatively privileged environments, there is deprivation. Among the learner participants at Wentworth, only 42% had access to home computers, only 33.3% had home internet access, and only one participant reported transferring funds over the internet compared with the overall figure of 25% for their city. However, compared to learners at the regional site and the more disadvantaged site in another state, learners here reported using a greater variety of new technologies, including banking, online shopping, job hunting, computer-based DJ applications and WebCam communication.

By contrast with the other sites, this adult literacy group included two learners from non-English speaking backgrounds, who joined the class to improve their spoken English. One of these was an information technology professional who described the paradoxical experience of being proficient in the new literacy but not in the old: 'I can talk with computer; I cannot talk with the people; that is the problem why I come' (Viet). Interestingly, this learner also listened to the Australian Broadcasting Commission (ABC) news online as a means of improving his English pronunciation.

The younger learners were keen users of text messaging: 'The best thing man came up with. I swear to god I love text messages' (Trish). They were more familiar with technical language—for example, describing capacity in gigabytes—than was the case at other study sites. They were also more aware of what they were missing out on: 'You know, like for instance I was nominating someone for a competition [and] you couldn't do it on the telephone, they'd rather you do it on the net, so I mean I think life would be a little easier if you had the internet' (John). 'When you like to know something just to go to the internet so if you haven't got a computer you must go to the library and look around and find the right book … the computer can give you the answer really quickly' (Vai). However, not all were so proficient. Rosa, a middle-aged cleaner, made redundant because of injury, was not familiar with the use of new technologies. Grace only encountered information and communication technologies 'last Monday, when I came here', while Vince, an unemployed young father, said that he did have access to a computer at home, 'but I've never used it because I never knew how, but I might now'.

Case 3: Extractive Industries WELL Program

Site three interviews were conducted during breaks in the delivery of a Health and Safety program to quarry employees among whom were labourers, managers and office workers. ABS data show that home use of computers and associated technologies is lower in regional areas compared with metropolitan areas (ABS 2003). However, ABS studies also show that there is little difference in business use of information technology between regional and metropolitan areas (ABS 2004a).

George, the trainer, was an experienced teacher of health and safety, who had taught some 8000 people over the past 12 months. Without any formal technology training, George had developed a high standard of technical mastery and had written interactive software tools for professional training and workplace tasks, at least one of which was widely used. He believed that training programs should include not only a skills dimension but also training on the management aspects of operating a business. He also believed they should contain 'basic computer literacy skills', as 'the success of their businesses and their ability to employ people will very much depend on their ability to use technology'. Incentives would motivate some adults to acquire computer literacy, but his experience told him that it needed to be 'coupled with face-to-face' to be fully effective.

A Workplace English Language and Literacy (WELL) tutor at this site, Elaine was another example of a professional adult educator who acquired her technical skills by immersion, chance and over a long time. Elaine made a point relevant to all the sites, and to the project overall. She was careful to describe herself as a 'communications' teacher rather than as a literacy expert. Although attention to literacy featured in her teaching, Elaine explained that in the training world, the word 'is used sparingly … It's usually kept under wraps for fear of offending'.

Elaine had encountered 'functional illiterates', who were 'usually young men in their twenties' for whom 'reading is a problem' as they 'don't enjoy reading and their attention spans are limited'. As trainers in the Health and Safety modules, 'we have to hide the fact that we are trying to help some people improve their literacy, but we also have to make sure that they got the Health and Safety message because that has become mandatory in the workplace'.

Like George, Elaine preferred a mixed-mode of delivery, and was reluctant to see workplace training delivered online as 'one of the important things of people coming to a block session is personal contact with the teacher, tutor and with each other—they learn so much from each other that they will not learn on a computer'.

As there was no opportunity in the tight program to interview the older and younger learners separately, the interview group comprised six people whose ages ranged from 26 to 65: Veronica and Phil (husband and wife), Greg and Max (father and son), Nick and Iris. At the first interview, the participants described a range of experience with information and communication technologies: Veronica and Phil, in their early 40s, were into 'the latest technology and gizmos' to keep themselves up to date with their children. They were self-taught, though Veronica believed that self-teaching might lead to inefficient ways of doing things.

Iris was in her late 30s, had used a computer for accounting and word-processing in her jobs over the last 15 years, and now texted and accessed the internet for personal banking, as well as learning new tasks from her children. Like Veronica, she had never been in a position 'where training for computers was in the job description'. Iris also read newspapers online. Nick watched a lot of television and didn't use a computer—he used the internet for the first time recently to make a purchase on e-Bay. At the second interview, he admitted to checking email for the first time and continuing to use e-Bay. Disappointed with the quality of a product he purchased, he learned to use email to contact the vendor. He texted regularly and felt at ease with the emergent language of messaging. Literacy having a real purpose was intrinsic to Nick's acquisition of new skills.

Greg was 65 and didn't use computers: 'It's a modern day thing, isn't it? And … old habits die hard. I guess that is where I'm sitting at this particular point in my life. I enjoy my work very much; computers are part of it, but I'm not pushing the buttons'. However, discussion of e-Bay during the group interview provoked Greg to visit the site in the week between interviews. Although Greg liked the idea of email, he stressed that he was an 'outdoors person'. By the second group discussion, his interest in information and communication technologies had been aroused and he said that he would 'give it a go'. Greg's son, Max, texted regularly, but admitted: 'I'm not that quick with it so I just sort of punch in very slowly; the person at the other end would be nearly asleep by the time it comes in'.

Although the learners agreed that computers are socially and educationally important, they insisted that there was a loss involved in their use. Veronica commented that it could be 'very solitary working on a computer', and she and Phil believed that young people are reading less, playing outdoors less and learning how to cut and paste rather than do research. Yet they all believed that young people should be exposed to technology. Further, while acknowledging the benefits of online resources, these learners valued the physical presence of the teacher. As Iris explained, the 'little stories' that George was able to weave into his presentations were the best part.

Case 4: Indigenous Learning Centre

Site four was a Centre for Indigenous Studies located in an outer metropolitan campus of a university. Health and employment are key areas of disadvantage for Indigenous Australians and educational programs such as this one are important Only 36% of Indigenous learners continue their studies to Year 12 compared with 73% of all students (ABS 2002).

The facility was housed in a modern building: the rooms were brightly painted, and there was an Aboriginal flag and posters with Indigenous themes. Christine and Simon were the coordinators and their shared office had two desks with computers on them that students often used.

The Indigenous Learning Centre was a community-driven program. Conservation and Land Management, Hospitality, Automotive, and Art and Design were the pathways through which literacy was taught. Christine, a former secondary teacher, deliberately used the term 'communication' rather than 'literacy'. She explained that both students had had 'very negative experiences through school and often associate the word literacy with … a lot of reading and writing ... [so] we do [literacy] in a seamless way'. An automotive class that 'died within weeks because they were put onto textbooks by the teacher' exemplified why an alternative approach had been adopted.

Although Christine regarded an integrated curriculum as the best approach to literacy and technology education, at this stage, no one in the program was integrating the use of computers for the development of literacy skills. Christine observed striking gender differences in computer use: 'The boys have an extreme resistance to reading and writing, unless it's on the computer … and unless it's an applied learning situation'. By contrast, she noted less resistance among the females: 'They do most of the reading and writing tasks that emerge from the community project even though they have the same lack of confidence that the boys have'.

Simon was recently recruited to the Pathways Program from the state unemployment centre where he worked as an Indigenous services officer. He first encountered computers in a TAFE course in a group comprising mainly older Indigenous people in the 1980s. Stressing the importance of a support base in helping learners develop skills, Simon actively used computers with students because the visual elements and the opportunities for play 'keep them interested'.

Simon believed computer literacy to be socially necessary and observed that students 'who have literacy and numeracy problems know a lot about computers and how to surf the net and that sort of thing'. He was amazed by students who could not read and write, yet could text with their phones. Technology was central to Simon's thinking: 'The way youth are today, no matter what colour, it's that networking stuff, how they do in terms of technology … and if you can harness that somewhere, channel it into efforts of employment or just in what they do in everyday life—that would do it'.

As all the educators interviewed in this study, Simon advocated 'literacy through subterfuge'. He described how Christine gave the students a task and soon they'd be doing something without realising it: 'I feel that that's about the only way you can teach these kids. Sneak it in there and we do it. And they walk away really proud about it'.

Mark was an older learner who had worked in the motor trades for 30 years. He described himself as 'TAFEed out' but was now studying for a Diploma in Visual Arts. He claimed technological ignorance but used the internet successfully 'to chase down research'. Pam, also an older learner, worked as a nurse for over 30 years and was now doing the third year of a Diploma of Visual Arts. Self-taught, Pam used Apple 11e computers in her nursing career: 'I actually love computers, love technology—that's the reason I don't have a computer at home because I would never be off it'.

Jason, the third older learner, worked as a labourer—an apprentice in carpentry, but never passed the theory part—musician, taxi driver, and assistant TAFE teacher, and was now enrolled in a Diploma in Visual Arts. Although he had a computer at home, it was not connected to the internet. He used the internet at TAFE to visit chat rooms and to play chess. In a Yahoo chat room, he met another Aboriginal person who turned out to be a relative: 'We ended up crying'. Since discovering the internet and email, 'I can't go off the damn things'. He was also texting.

Although Mark, Pam and Jason studied multimedia at the TAFE and produced a CD, they were unanimous that many new technologies are for the young. Mark observed that the internet had had a major impact on Indigenous communities: connecting individuals dispersed over great distances and providing information about different communities, especially about art and remote groups. Pam liked the technology as it 'opens up a whole world that you don't have to spend a lot of money to see'. The three of them mainly used digital technologies at the TAFE. Pam borrowed a laptop to write an essay and Mark used his home computer for word processing.

Three younger students, 15-year-old boys, were also interviewed, all of whom began using computers in Year 3. They had computers at home, but Pete's was broken. Errol played multi-user games on the internet. He had also visited Player cafes but really couldn't see the point as he could 'meet' other people online. The three young men had broadband connections at home. Errol liked the mobility and freedom of a laptop. None believed that computer skills for the workforce applied to them, in their chosen courses of Hospitality, and Conservation and Land Management.

Case 5: Mitchell ACE, regional community education provider

The fifth case study took place in a large adult and community education provider located in a regional town. Just over 20 years' old, with 4000 enrolments, it is located in one of Australia's most disadvantaged regions. The overall unemployment rate is 12.8% (ABS 2004b), while youth unemployment runs at 22.9%, and the community is ageing at a rate above the state average.

The teachers interviewed at this site considered the available information and communication technology equipment to be outdated: 'It's a huge frustration. All the equipment we use is substandard and the worst part is nothing is standardised. We get all the leftovers. It is tricky for beginners' (Anne). Apart from the lack of power in the machines, the wiring in the building was out of date and rooms regularly lost power. There was no email system for staff and limited use of administrative software. The machines available to learners were old and frequently broke down. To access the internet, learners commonly used machines in the teachers' shared office and some teachers expressed concern at the resultant lack of privacy. Mitchell ACE did not have a plan for the development of its technology resources, nor did its staff articulate a shared view of the place of information and communication technologies in teaching and learning. We spoke with four educators: Elena, Ray, Anne and Gail. Elena and Anne expressed positive attitudes towards the use of information and communication technologies in the classroom and both encouraged learners to use them, but Ray and Gail were not interested in, and in some ways hostile to, the use of technology in learning, as well as more generally in society.

In common with other adult and community education providers, this site was managing on a shoestring. As a consequence, the centre had only recently obtained technical support for its information technology equipment and had only a small budget for the professional development of its staff. Nevertheless, Elena had attended classes in MS Publisher and MS PowerPoint. She had sought online learning resources from the TAFE VC and TAFE Frontiers and had used *Writers' Caravan* with her classes. Anne drew attention to the small professional development budget and argued that the priority for professional development for literacy teaching was for youth work and for supporting learners with psychiatric disabilities.

Ray was over 60, a retired secondary teacher, only recently recruited to the centre. Information and communication technologies did not feature among his many interests: 'I don't know why, I just can't seem to muster any interest in computers … I don't need them. I never have … [I'm] just what they call a Luddite'. However, despite his claim that he did not need computers, Ray confessed that his wife used a computer on his behalf for family business and that his son, a computer instructor, 'puts these programs on the computer for me like Golf and stuff'. He also had a mobile 'just for emergencies'.

Although Gail was the under-40 teacher interviewed, she had more negative attitudes towards information and communication technologies: 'I hate computers which is probably what you don't need to know'. She explained her 'hatred' of computers as a result of being 'more artistic'. Gail said that when the computer 'works, it's wonderful and when it doesn't I get the shits and I get too frustrated with it'. Not surprisingly, Gail did not encourage her learners to use technologies. She not only believed that she didn't need technical skills, but also that they were not necessary for her learners:

> I prefer it if they actually used their imagination and did it on paper, fairly old fashioned I suppose but I find that it works … I've got four computers in the room and I reckon out of

> the nine students I've got, not one of them has asked in the last four weeks if they can turn on the computer.

The learner participants at Mitchell ACE had little experience with information and communication technologies apart from some limited classroom use at the learning centre. They considered computers frustrating and difficult. Andy had a mobile, but 'only turns it on when the car breaks down'; however, he was the most enthusiastic advocate for the internet and had been enjoying his first steps to find online help to maintain his Harley Davidson. Sharon was in the literacy class because her employer identified her low literacy skills and advised her to seek help. She had very little experience with new technologies and did not even use an ATM: 'Well my husband does. He's got my card'. However, she and her ten-year-old son played computer games. Craig was the only learner who described experience with information and communication technologies at home and had for a time managed a pornographic website: 'It only lasted two months because once every month the search engines do an update … you get ranked once a month and I was in the top 20 for two months.'

In response to questions about issues affecting their information and communication technologies learning, they all nominated 'old files and slow programs' as a problem. They also explained that there was only limited internet access. Most expressed interest in having computers and internet access at home but gave the impression that the world of technology was not a reality for them: 'See I would be satisfied if I could get the internet for three months right and then just see everything I want and not worry about it for another couple of years' (Steve).

The participants' digital literacy practices

The participants provided information about their use of new technologies through their diaries and also in the individual and group interviews. These data are shown in table 2, *Information and communication technology usage by case-study participants*. The data have been pooled for educators, for younger learners, older learners and for the total number of learners. These figures are compared with the 2001–02 data for all Australians households (ABS 2003). Interpretation of the comparative data needs to take into account the fact that the case-study sites were visited in 2004, while the ABS collection was two years earlier. As Australian usage of information and communication technologies continues to expand rapidly, we suggest a cautious approach to claims about what the data might mean.

The collection of technology usage data from learner participants proved difficult, as more than half did not keep diaries. The educators suggested that sensitivities around revealing low literacy coupled with a related fear of officialdom probably explain why. Most information on the learners' usage emerged during the group interviews, with the public nature of this exchange perhaps influencing the responses. Further, the data from the group of ten older learners appear to be atypical. The figures were skewed by the quarry industry participants who reported good access at home to information and communication technologies.

It is important to note that the case studies revealed that the extent of the learners' usage of information and communication technologies is less than the figures suggested. Even though they reported access to a range of technologies, they described the quality of the technology and their skills level as basic. This brings into question the meaning of other data sets such as the ABS collections. What is really meant, for example, by the statistic that 61% of Australian households have access to a computer at home? How powerful is the computer? Who actually gets to use it? Given our difficulties in obtaining written information from adults with low literacy, how does the ABS collect information from similar respondents?

The table certainly provides a profile of the participants' technical skills and practices as enacted daily in their lives. While it does not identify the full spectrum of new literacy practices—only a whole population-based study could do so—it demonstrates that participants had at least some

experience of a wide range of skills: wider than was evidenced in the adult literacy classes. As well as the skills recorded in the table, individual educators also described additional technology-mediated skills, including genealogy research and the design of model railway control systems.

Table 2: Information and communication technology usage by case-study participants, %

	Learners aged under 40	Learners aged over 40	All learners	Educators	ABS household data for 2001–02
	N=32 %	N=10 %	N=42 %	N=13 %	%*
Has home computer access	52	90	62	85	61
Has internet access at home	44	80	54	85	46
Buys or sell on e-Bay; buys tickets online	15	10	14	46	23
Owns a mobile phone	44	80	54	69	72
Uses text messaging	37	40	38	46	
Has a digital camera or DVD	33	30	32	38	23
Uses ATM/EFTPOS	4	20	8	38	
Has a dedicated games machine	48	70	54	31	32
Uses internet banking	9	0	7	38	

Source: *ABS (2003), 2001–02 cat. no.8146.0

Responding to the research questions

What is the relationship between literacy practices and the use of information and communication technologies in adult literacy education?

The case studies revealed a range of information and communication technology practices amongst the participants: individual educators and learners identified different skills, beliefs and understandings about their interactions with literacies. However, no participant's life was untouched by these technologies: it was evident that the link between contemporary literacy practices and the use of information and communication technologies was inextricable. The educators also described a range of institutional practices governing technology provision in their workplaces that affected teaching and learning. Table 2 indicates that the educators and the older learners interviewed in 2004 had relatively high levels of technology experience compared with ABS data collected in 2002 (ABS 2003). However, we make these comparisons cautiously, given that the ABS report also showed that between 1998 and 2002, the number of households with home computer access rose from 44% to 61% (ABS 2003, p.5). Notwithstanding, these data provide interesting information about the information and communication technology practices of the educators and learners who participated in the study.

The educators and the ten older learners reported high levels of experience with information and communication technologies facilitated by home computer and internet access. To reiterate, four of the ten older learners in the study, who were participating in an enterprise-based adult literacy program in the mining industry, were also employed. The ABS 2002 survey found that the main reasons households gave for lack of home computers were: 'costs too high' (26%), 'lack of interest in computers' (26%) or 'no need for a computer' (23%) (ABS 2003, p.13). Apparently, these considerations did not influence the older learner participants. Their enthusiasm for information

and communication technologies was palpable: 'I punched in e-Bay and away I went!' (Nick, Extractive Industries). However, one or more of these factors seems to have affected some participants within the younger learner group, which reported low levels of usage compared with the Australian population. This comparison is of concern, given that the young people appeared to be as disadvantaged in the use of technologies as they were in other literacies. The group interviews with the younger learners indicated that lack of money was the main reason for their limited experience of information and communication technologies.

Learners brought experience with text-messaging, word-processing, internet searching and online buying and selling into the classroom: multiple literacies, indeed. This was evident in the variety of uses reported by the younger learners at Sturt and Wentworth institutes and exemplified by Jason, an older learner at the Indigenous Learning Centre, who was the 'fastest texter in Rosetown'. Some learners used information and communication technologies in their work and several had sophisticated technical skills. Viet (Wentworth Institute) worked in an information technology support role in a large government department. He described communicating with his parents in Vietnam via WebCams and high-speed computers that he had set up in both homes. A learner such as Viet had higher expectations of digital literacy practices in the classroom than some other learners. He complained that the computers available to adult literacy learners at Wentworth were slow compared with the latest '3 bit processor'. Other learners, such as Caroline and Mike at Sturt or the older learners at Mitchell ACE, brought little experience into the classroom and seemed content with what their teacher regarded as barely adequate information and communication technology facilities. Accommodating the differences between learners in the degree and range of their experiences of technologies represents a major challenge for adult literacy educators.

We have already noted that the educators provided evidence of more extensive information and communication technology experiences than the younger learners or the learners as a whole. In most cases, their use of technology was more prevalent in their private than in their professional lives: internet banking, online real estate, share transactions, genealogy research, and participation in email distribution lists and newsgroups. Elaine (educator, Extractive Industries) said that she did not need to use computers in her teaching, yet managed the family investments via computer at home. Even Gail (Mitchell ACE), who hated computers and discouraged their use in her classes, admitted to two computers and a PlayStation at home. The practices used at work included teaching learners how to use presentation software, but the commonest use was word-processing to produce handouts. Most educators seemed to assume that classroom information and communication technology practice should focus on the conventional computer applications identified in VET Training Packages and curriculum documents such as word-processing, spreadsheets, and internet searches. Overall, the technology-mediated literacy practices evident at the research sites did not reflect the variety of technoliteracy practices reported by the educators and the learners as intrinsic to their lives. Katrina and Jillian at Wentworth were the only educators to articulate the importance for learners of new literacies such as online banking and information gathering from government departments.

The influence of institutional cultures on technology provision for adult literacy education became apparent when differences emerged in the information and communication technology facilities available at the research sites. Katrina (Wentworth) told us that the institute had prioritised the use of technology in teaching and administration and that '*everything* is online'. However, the other sites were less well resourced, and, as the Sturt educators pointed out, were often less well resourced than programs such as engineering and design.

Concern about low funding for the adult and community education sector was reflected in the reports we had about inferior equipment. The educators at Mitchell ACE reported outdated and poorly maintained information and communication technology equipment. Anne and her colleagues were frustrated about their equipment: so 'substandard' that 'teachers lead the students by trial and error, and that's not really good enough'. Mary (educator, Sturt Institute) also told us about inferior hardware: 'I find it frustrating because I have all good intensions … and the silly things overheat and cut out at a vital point, just when we're getting into it'. When asked for a wish

list, the educators identified many items: customised learning resources (Sturt Institute); scanners and more server space per teacher (Wentworth); networked laser printers, a data projector, an electronic whiteboard, a photocopier that prints double-sided, good wiring and technical support (Mitchell ACE). These needs represent a technology-mediated sea change in the resource requirements of adult literacy education. Before the use of information and communication technologies became ubiquitous in the developed world, adult literacy education required little equipment and was relatively cheap to deliver. The expanding cost of provision in a world increasingly mediated by the use of information and communication technologies represents a major issue for adult literacy education.

What are the new literacies required for effective and critical use of information and communication technologies in adult literacy education?

Green (1988), and Durrant and Green (2000) have described technoliteracy as a social practice with three dimensions: the operational, the cultural and the critical (cf Lankshear & Snyder 2000; Snyder 2000). This three-dimensional model assumes a number of understandings relevant to this study: that the new literacies associated with the use of technologies are multiple and based on the convergence of previously separate modes of communication; that the use of information and communication technologies, in and of itself, is unlikely to produce significant educational enhancements in literacy learning; and that it makes little sense to speak of technology having an impact on literacy, as the connections are far more complex than a uni-directional, causal relationship might imply.

The three-dimensional model provides a useful framework for considering the literacies required for effective and critical use of technology in adult literacy education. Applying it to the current study, the 'operational' dimension represents the technical skills or knowledge needed to function in an adult literacy learning environment; the cultural dimension refers to the context in which adult literacy educators and learners use technical skills and make meaning; and the critical dimension relates to the imperative for adult literacy learners and educators to use technology critically, reflectively and creatively. The analysis of the data enabled us to identify the literacy practices required for the effective use of technology in adult literacy education. These are now categorised according to the three dimensions.

Technical literacies required for the use of information and communication technologies in adult literacy education

As already discussed, most of the educators thought about the use of technologies in adult literacy programs in terms of the acquisition of discrete skills for academic or work purposes. However, the lived technology experiences of the case-study participants suggested the need for a broader view of the new literacies required in adult education—in particular, for the inclusion of information and communication technology 'life skills'. As Greg, an older learner in the extractive industries group, said: 'You need ICT skills for paying bills, getting the weather, all that sort of thing'. Many of the learners described uneasy experiences with new technologies, including buying and selling on e-Bay. Some had particularly poignant stories. For example, Caroline, the partially sighted older learner at Sturt, reported her difficulties with using ATM machines: 'I was trying to get the money out and I wasn't putting the zeros in properly, so I used to just have to go into the bank every fortnight … so in the end I decided to tell her what the problem was … and she came outside with me, showed me how to do it, so now I can do it properly'. As a group, the educators had much more expertise in a range of information and communication technology practices than the learners; however, the educators were not using this knowledge in their teaching. Despite learners' needs, with the exception of the Wentworth team, the educators did not appear to believe that everyday applications of technologies had a legitimate place in the classroom. This is not surprising given that information and communication technology instruction in adult education has been based historically on learning how to use the common business software packages. The case studies, however, indicated the need to include information and communication technology 'life skills' in adult literacy education. It is arguably more useful for learners to be taught how to bank online than how to edit a document.

Cultural literacies required for use of information and communication technologies in adult literacy education

Although important, it is not sufficient to take account only of the technical literacies required for effective technology-mediated practice in adult education. The cultural dimension of technoliteracy, through which users make meaning in specific contexts of use, is perhaps even more important. There were several instances of technology-mediated literacy practices in the sites that highlighted the importance of the cultural dimension of literacy. The first involved the 'multi-tasking' associated with the use of literacies. As Katrina (educator, Sturt Institute) told us: 'They've got their little Yahoo messengers, so they're doing their essays and messaging their friends … They also plug their CDs in'. Katrina described the integration of technical skills development and other learning in her classes: 'She's doing literacy, but she's also doing computing and writing her life story'. The operational and the cultural dimensions had come together. The young people had learned to use information and communication technologies, not as an end in itself, but so they could perform other contingent tasks, ranging from writing a life story, to banking, to booking AFL tickets online.

The second instance suggested that the new literacy practices described by the participants were part of more nuanced literacy learning environments in which relationships amongst learners and between educators and learners were being redefined. The relatively superior text-messaging skills of younger participants compared with older participants represents just one example. As George (educator, Extractive Industries) put it: 'Why do young people use text messaging? It's cheaper and when you have little money and you have access to technology, and a telephone call costs you x and a text message cost you x minus, you will use the text message. That's the prime reason why they use it. Why don't I use it? Because it's slow and it's cumbersome and I'm not quite so cost sensitive'. At several sites, non-English speaking learners, rendered 'illiterate' by the experience of immigration, were more adept in their use of information and communication technologies than any of the educators. Elena (Mitchell ACE) described a learner who had previously been a computer salesperson in Turkey. Though not literate in English, he was able to build his conversation skills as he helped other students with computing tasks. As Ray (Mitchell ACE) exclaimed: 'These guys know how to use computers much better than I do!'

Critical literacies required for use of information and communication technologies in adult literacy education

Most of the educators did not acknowledge the importance of critical literacy for effective technology practice, and overall there was little evidence of attention to this all-important dimension of literate practice—techno or not. There were hints of it, perhaps, in the indignation of learners and educators when things did not work. Pam (educator, Indigenous Learning Centre) was aware of the politics of the sector: the promise of computers, but never new ones, always someone's discards. Similarly, the amount of technical support was inferior to better positioned groups within the institution. She also told us a story about virus-infected software that was supposed to be fixed, but never was: she hinted that the less powerful programs at the TAFE were commensurately less likely to get help. There were also glimmers of an emerging critical perspective amongst some students. Nick, an older learner (Extractive Industries), quickly became savvy about e-Bay when he told us: 'I worked out what e-Bay was all about'. And several other learners told us that they were learning how to use online resources, rather than be used by them. For example, with appropriate scepticism, Viet (learner, Wentworth Institute) reported: 'If you want to study you can go to the website somewhere and study any subject you want, and after you study, you can answer a survey and get certificate and get a job more easily and convenient'.

Although our study was carried out seven years after the *Digital Rhetorics* project (Lankshear et al. 1997, reported in Lankshear & Snyder 2000), our findings in relation to the critical dimension are similar. Across the five sites, there was little evidence of attention to the promotion of critical awareness. We know that the effective use of information and communication technologies in adult literacy education includes not only the capacity to use the technologies and to understand how cultural meanings are made with them. It also requires the ability to critically filter and evaluate

electronic sources of information in response to the new literacy demands associated with a digital world. Even more significantly, it involves understanding how the use of information and communication technologies fits into social and economic relationships and purposes.

What changes to pedagogical practices are associated with the use of information and communication technologies in adult literacy programs?

From what we have presented so far, it will not be surprising to discover that the use of information and communication technologies in adult literacy education is associated with pedagogical change. Our sense is that an additional question needs to be asked: What pedagogical changes are required to ensure that learners are enabled to use information and communication technologies effectively for literacy purposes?

The interactions between the use of information and communication technologies and pedagogical practices are complex and reciprocal. The use of new technologies can both enable and redefine teaching and learning about communication. For example, as Katrina (educator, Wentworth Institute) explained: 'ICT has changed the development of written communication skills. For example, the first draft will be straight into the computer. They'll save that and it's manipulating the text ... it's easier for them to see how you structure an essay because you've got your blocks and you can chunk them off and highlight them and move them around ... It's so much easier for them to manipulate the text and to be powerful with the text'. Learners and educators offered further similar examples. Elena (educator, Mitchell ACE) and some of the older learners (Indigenous Learning Centre) described the use of sophisticated PowerPoint presentations in adult literacy classes.

The use of information and communication technologies can both enable and disable learners in adult education classes. For example, several disabled participants found it easier to perform tasks with new technologies than with hand-held pens or pencils. This was so for Mike, the learner from Sturt, seriously disabled through a car accident and for Katrina's learner with arthritis. However, some learners, such as Sturt Institute's Caroline, were less able with information and communication technologies than with non-digital technologies.

Teaching for the new literacies requires more sophisticated technical expertise and technical support than has ever been the case in adult literacy education. There were computers in every classroom visited at the case-study sites, but these varied in age and usefulness. As we have already reported, the educators differed in their ability and willingness to use digital equipment and teacher attitudes influenced learners' responses to literacies. In the study, these two extremes were personified by Katrina, who had never met a student who 'absolutely refused' to use a computer or was 'terrified' to use them, and by Gail whose nine students had not once asked to use the computers over a four-week period.

Effective pedagogy for the new literacies requires educators with strong operational skills, and with access to quality, reliable equipment and to technical support. A number of the educators spoke of their need for teaching and learning resources to support digital literacies. Some mentioned using low-cost resources such as the *Writers' Caravan*, available through Victoria's TAFE Frontiers or the BBC's online learning site. Most used the online version of the traditional adult educator's tools—that is, they found, created or shared their own resources as best they could.

If we consider the changes to pedagogical practice required to support effective literacies in the new techno-learning contexts, we need to provide opportunities for all adult literacy educators to develop a confident and coherent approach to the inclusion of new literacies in their teaching practice; they require opportunities to consider how to integrate the use of information and communication technologies into adult literacy education. In particular, they should be encouraged to broaden the scope of the information and communication technology literacy applications available to learners to include digital 'life skills' such as banking, shopping and seeking information online.

What are the professional development needs of educators when information and communication technologies are used for teaching and learning in adult literacy programs?

Again drawing on the three-dimensional model of technoliteracy practice, professional learning for educators in the use of information and communication technologies in adult literacy teaching could begin with attention to the development of operational, cultural and critical understanding and expertise. In the study, the technical skills of the educator participants varied, with some (for example Gail and Ray) limited by low skills and others (Katrina, Mary, etc.) integrating sophisticated skills in their teaching. Most of the educators had some needs for technical skills development. The rapid changes that characterise information and communication technologies mean that educators will always require technical skills development. For example, Katrina (Wentworth) described helping her colleagues to use her institute's new online document production system. Most of the educators described their own technical skills as self-taught: 'I first started using computers when my first child started using a computer' (Elena, educator, Mitchell ACE). Many of the educators preferred to learn in this way and to seek help when necessary. The availability of that help was important but was not always present at the sites. Educator Jillian described an excellent professional development program that had previously operated at Wentworth and had then been discontinued as a casualty of cost cutting.

We have already noted that in their literacy teaching the educators tended to focus on technology-mediated literacy for academic and business purposes, rather than on the learners' needs to acquire new literacies for a range of purposes in their lives. We have seen that many of the educators described rich experiences in the use of information and communication technologies in their private lives (see table 2), but not in their teaching. There appears to be a need for professional development that enables educators to share this wider range of technology uses with their learners and even with their colleagues. Such professional development in the use of new literacies for a range of context-specific purposes needs to pay attention to the cultural and critical dimensions of new literacies, as well as to the technical skills required to achieve them. Perhaps there is also a need for changes in curriculum to legitimise a broad-based approach to teaching the new technoliteracies in adult education settings.

Many educators spoke of their ongoing need for teaching and learning resources to support technology-mediated literacy teaching. Some mentioned low-cost materials they had found; others told us of some expensive mistakes. For example, the educators at Mitchell ACE described how their centre had invested in a set of information and communication technology learning resources that had turned out to be unsuitable, but could not be returned. Without doubt, the provision of ongoing professional development opportunities to support educators to source and develop teaching and learning resources is required. This, like the support for new pedagogies, needs to be infused with the contextual and critical approach fundamental to effective technology-mediated literacy practices. Unless opportunities are created to promote these changes to practice, then the likely outcome is that old approaches will linger and the integration of information and communication technologies into adult literacy education will be stalled.

A further finding

As research is always messier in reality than how it is represented in reports, we include here a finding that did not fit neatly under the four research questions. The educators at two of the sites (Extractive Industries and the Indigenous Learning Centre) preferred the term 'communication' rather than 'literacy' to describe their work with learners. They saw the word 'literacy' as not only strongly associated with the world of print, but also connected to the stigma of failure. It is of interest to note that when we discussed the draft of this report with the members of the Advisory Committee, of all the key findings, this one struck them as particularly significant.

Conclusions

Some of the conclusions set out here will be familiar, even self-evident, to certain readers, while others may be new, even challenging. As the enduring value of human contact in educational settings was brought home powerfully in this research, we begin with what is increasingly self-evident. Technology is often discussed in enthusiastic terms in education planning. It is seen to offer potential for lowering costs, making delivery of education and training programs more efficient, diversifying curriculum, and overcoming certain kinds of disability. Many of these claims are true, many of the benefits are of inestimable value, and to the extent that the equalising, diversifying and enriching possibilities made available by technologies are achievable, they are commendable and should be pursued.

However, it must also be stressed that effective teaching and learning, even in technology-mediated settings, most often involves interactions among humans. As teaching and learning are profoundly social and socialising activities, teacher–learner relations, and learner–learner relations, are an indispensable part of the effective implementation of technology, the construction of new meanings and understandings about technology, and the development of an appropriately critical response towards its use.

The study found that the use of technology by both learner and educator groups was more widespread than we had anticipated. There was broad acknowledgment of the social and cultural importance of the use of information and communication technologies and when teaching and learning were built around a concrete social purpose and a specific technology, the quality of teaching and learning was considerably improved. By embedding technology-mediated literacy within a social or occupational purpose, the literacy practice became associated with a clear and defined end-point and the social stigma of personal failure that often attaches to literacy was lessened or avoided. However, although some of the teachers acknowledged the importance of an authentic social purpose and the need to build teaching around specific technologies, the adult literacy programs we investigated often lacked both. We concluded that to facilitate the effective integration of the use of information and communication technologies in adult literacy education, concerted teacher professional development activity is needed.

Despite some notable individual exceptions, older learners appeared to be the group particularly lacking in incentives and opportunities to acquire skills with literacies. Individuals who had embraced computing at an older age were able to improve the quality and connectedness of their lifestyle, and their example will be persuasive to others. However, there remained a considerable age disparity in relation to the use of the technologies. The rapidity of the introduction of new modes of digitally mediated communication into the market place brings in its wake raised barriers to access information and to associated social and employment opportunities.

Among the older adult literacy learners who participated in the case studies, many were unemployed and suffered compounding multiple disadvantages, including physical disabilities and material deprivation. In some cases, the technologies themselves were not only costly to acquire and maintain, but also their required use by banks and other commercial outlets penalised these individuals. Low-cost access, facilitated by introductory programs, and well-maintained hardware and software, are needed to prevent entrenching or even extending existing disadvantages.

Among the younger learners, the study highlighted the reality that labour market and training/education access are dependent on information and communication technology literacy and that there is a need to enhance the quality and range of opportunities for this group to acquire integrated literacy/technical skills. There appeared to be a particular need for young boys and men to be provided with targeted support in technoliteracy practices.

The study suggested that email, electronic chatting and text messaging on mobile phones could be used more extensively within adult education programs. These modes of communication, each of which involves discrete literacy practices, were intrinsically interesting to many of the learners. Working collaboratively with learner communities to design programs that respond to learner characteristics, and to various community and labour market demands, and that integrate the literacies needed to handle contemporary multimodal formats, are the ingredients for success.

With opportunities to discuss openly the cultural implications of information and communication technology use and technology-infused teaching, it is likely that local solutions to information and communication technology challenges will emerge. As a result, teachers will more readily perceive technical skills as pervading all contemporary teaching and learning and may develop more commitment to the design of courses and programs that integrate the use of literacies. Sessional and part-time staff, which comprise most of the people employed in adult literacy education, need to be included in professional development activities that focus on technology-mediated literacy learning. Specific funding for the use of information and communication technologies in teaching and learning, and for self-access and self-directed learning, would also be beneficial.

It is not only the programs, however, that need to accommodate the new digital regime. The study suggested that institutional information technology policies are most effective when they are sensitive to the special needs and difficulties of disadvantaged groups, so that access routines (passwords and security systems) and the compatibility of applications are examined. Policies can aim to minimise the financial expectations that are placed on learners, respond to their personal information and communication technology circumstances, and actively explore the strengths and limitations of delivering sets of knowledge and skills by direct teaching, by team work, individually in various digital modes and in networked modes.

Overall, the study concluded that there was sufficient coherence across the case-study sites to make a case for curriculum, pedagogical and program reform. One important dimension of such reform might be to invoke a new understanding of the task at hand. Instead of alleviating disadvantages with print literacy skill, thereby provoking concern among learners about social stigma in relation to their literacy levels, it might be more effective to conceive of the enterprise as 'communication effectiveness' education, in which information and communication technologies play an integrated and important part.

In summary, our aim has been to look at literacy, technology and learning in ways designed to help readers understand current practices and to anticipate future directions for adult literacy work involving new technologies. The study has presented a sense of the challenges that face the sector in the context of current technological change. Moreover, it has provided a knowledge base from which the sector may develop ideas, strategies and plans for building on existing strengths and addressing current shortcomings in pedagogy, policy and professional understanding at the literacy–technology interface.

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Appendix A

Diary of ICT-mediated literacy activities kept by educators and learners for one week

Using ICT diary

Thank you for agreeing to assist with this research project. The diary phase of the project will help the research team collect information about how educators and learners use information and communication technologies (ICT) in their daily lives.

Please use this booklet to record your weekly ICT use. We are interested in your ICT use both at home and at work.

We are interested in all ICT use including, but not restricted to, the following:

Email	Wordprocessing
Use of spreadsheets	Internet banking
Text messaging	Information services on digital TV
Handheld computer	Centre website

The booklet provides you with one page daily for seven days. The example below demonstrates how to record information in the diary.

Day 1			
Example of ICT Use	Home OR Work Please specify	Duration of use	Reason for Use
Checking email	Work	20 minutes	Answered 2 emails from students Sent email to centre administration officer asking her to order some OHPs Accepted an email meeting request
Internet	Home	60 minutes	Looked for cheap airfares for upcoming skiing holiday in New Zealand Helped daughter find information for school project on quokkas

If you have any further questions you can contact one of our research team:

Contact Name: Dr Anne Jones

Phone number: 03 9286 9294

Email: a.jones@bhtafe.edu.au

Day 1			
Example of ICT Use	Home OR Work Please specify	Duration of use	Reason for Use

Appendix B

Membership of the Advisory Panel

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Support document details

Additional information relating to this research is available in *Using information and communication technologies in adult literacy education: New practices, new challenges—Support document*. It can be accessed from NCVER's website <http://www.ncver.edu.au>. The document contains:

- ✧ Literature review
- ✧ Case studies

Other publications on adult literacy and numeracy

Adult learning through fire and emergency service organisations in small and remote Australian towns
Christine Hayes, Barry Golding, Jack Harvey

Adult literacy and numeracy: At a glance
Sue Foster, Francesca Beddie

Building sustainable adult literacy provision: A review of international trends in adult literacy policy and programs
Rosa McKenna, Lynne Fitzpatrick

A fair go: Factors impacting on vocational education and training
Judith Miralles

Integrated approaches to teaching adult literacy in Australia: A snapshot of practice in community services
Rosa McKenna, Lynne Fitzpatrick

Literacy in the new millennium
Michele Lonsdale, Doug McCurry

Literacy, numeracy and alternative dispute resolution
J Joy Cumming, Janice M Wilson

Reframe, rename, revitalise: Future directions for the language, literacy and numeracy national reporting system
Kate Perkins

Two-dimensional work: Workplace literacy in the aged care and call centre industries
Peter Waterhouse, Crina Virgona

What is all that learning for? Indigenous adult English literacy practices, training, community capacity and health
Inge Kral, Ian Falk

For further information on these publications visit the NCVER website <http://www.ncver.edu.au>.

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