

IT Skills and Schooling: Rethinking assumptions about access

Peter G. Taylor

Griffith Institute for Higher Education

Griffith University

peter.taylor@mailbox.gu.edu.au

Abstract:

Where once schools focused on teaching disciplinary knowledge, they are now required to develop new capacities focused on lifelong learning, including access to and skills in the use of IT, particularly the Internet. This paper investigates aspects of this challenge, drawing on DETYA-funded research into the development of ICT skills in Australian schools (Meredyth, Russell, Blackwood, Thomas & Wise 1999).

In particular, the paper examines the issue of access and equity in terms of expectations which are confirmed and challenged by Australian and overseas findings. One focus for this examination is the finding that students tend to learn most of their IT skills in settings *other* than schools. The analysis illustrates ways that equity and access to (lifelong) learning is unlikely to be an outcome of either new policy initiatives or the introduction of new technologies.

It can be taken as 'a given' that we have entered 'the information age' in which paid work is increasingly focused on manipulation of information through the use of new technologies. Allan Wood (1999) reports that "[t]he US Commerce Department projects that by 2006 nearly half of the US workforce will be employed in IT industries". In this context, development of the Internet is challenging old forms of knowledge distribution, including traditional educational practices. Where once curricula confidently mapped what had to be learned, schools are now required to develop specific capacities for engagement in lifelong learning and to provide access to and skills in the use of IT, particularly the Internet. The latter is seen to provide both access to World Wide Web (WWW) based information, and a context in which students can develop a range of new skills. These imperatives are the objects of this paper's inquiry into issues of equity and access. It explores several questions. What implications do the wide availability and use of ICTs have for current concerns for skills development reflected in national and state curriculum documents? What implications do they have for formal education more generally, and particularly its contribution to social justice and equity? These questions are neither esoteric nor hypothetical. They arise in the context of specific sets of institutional and government priorities, and broader cultural phenomena. Before turning to these broader issues, I want to offer quite specific research evidence concerning the development of Australian students' skills in information processing and computing.

Developing ICT skills – findings

In 1997 the Australian government's Department of Education, Training and Youth Affairs (DETYA) invited tenders for a national study to provide information on progress against Goal 6d of the Common and Agreed Goals of Schooling—to develop in students skills of information processing and computing. The study was intended to provide input into the Annual National Report on Schooling, and as the first such national study, to provide benchmark data for subsequent comparative studies. The report of this study— *Real Time: Computers, Change and Schooling* (Meredyth, Russell, Blackwood, Thomas and Wise 1999)—provides a snapshot of student skills in the context of current policy and practice in the provision of information technology teaching and learning in schools. It provides survey response data from a representative sample of schools (and the Principals and samples of teachers and students of these schools) from all Australian States and Territories, from all levels (primary and secondary), and from all sectors (government, Catholic and Independent). In all, 222 principals, 1258 teachers and 6213 students completed the questionnaires. Students were in the final year of their primary education (ages 11-12), or the final year of compulsory education – Year 10 (secondary, age 15).

In general, the research confirmed a range of expectations, including that:

- progress has been made in the development of the intended skills;
- skills development has not been uniform across states, regions or systems;
- more progress is needed in particular areas
- schools need more resources, particularly in terms of maintenance of existing resources; and,
- teachers need more professional development.

None of these is surprising. However, a more detailed look at a narrow range of findings raises issues central to the focus of this paper. The research findings I want to highlight relate to the proportions of respondents who claim to have specific skills, and their claims concerning where they first learned these skills. Table 1 includes selected samples of responses from both teachers and students. In the report the data is provided in two sets: fourteen basic skills, and thirteen advanced skills. Table 1 includes four 'basic skills'—use a mouse; save a document; open a saved document; and, move files—with the remainder designated as 'advanced skills'. They are arranged in descending order of claimed achievement of the skill by students.

Core Skill	Students			Teachers		
	% have skill	where acquired % home % school		% have skill	where acquired % home % school	
Use a mouse	98	63	35	99	35	45
Save a document	95	57	38	97	35	39
Open a saved document	94	57	37	96	35	39
Draw using a mouse	93	61	29	77	33	30

Creative writing, letters etc	92	59	28	85	40	30
Move files	78	47	29	82	32	32
Use the WWW	65	25	29	76	22	34
Send an email message	53	25	19	65	22	27
Create program	52	22	25	45	9	15
Create a multimedia presentation	48	25	19	37	12	15
Make a Web site/home page	38	17	15	22	7	9

Table 1: Skill achievement and where first acquired

Several trends are evident within this data set. While it is clear that teachers and students claim an impressive level of skill development there are differences in their claims. For those skills where there was appreciable gap between the claims of students and teachers, those differences indicated superior skills for teachers in three basic skills and four advanced skills. On the other hand, students claimed appreciably superior achievement to teachers in eight of the thirteen advanced skills. Thus, the research found that students are no less skillful than their teachers, and tend to see themselves as more skillful for the more advanced and creative skills.

Core Skill	Government			Catholic			Independent		
	% have skill	where acquired		% have skill	where acquired		% have skill	where acquired	
		% home	% school		% home	% school		% home	% school
Use a mouse	98	58	39	99	66	33	99	79	22
Save a document	94	51	42	95	61	36	97	71	29
Open a saved document	93	52	41	94	61	34	97	71	28
Draw using a mouse	92	56	32	93	65	26	96	75	21
Creative writing, letters etc	91	55	38	93	60	33	95	69	28
Move files	77	43	31	75	49	24	85	56	29

Use the WWW	62	21	29	60	23	22	80	39	34
Send an email message	49	21	18	48	23	14	71	38	27
Create program	49	22	24	50	24	21	63	28	34
Create a multimedia presentation	45	23	17	44	24	15	62	31	27
Make a Web site/home page	35	15	14	33	15	11	51	24	23

Table 2: Sector-based comparisons of skill achievement and where first acquired

Second, it is evident that, for students, the home is a more important location for initial skill development than schools. This is the case for all of the basic skills reported in the original report, and for nine of the thirteen advanced skills. In addition, this trend is accentuated for students attending private (independent) schools, while students in public (government) schools are least likely to acquire ICT skills at home (see Table 2). This is exemplified in the skill 'draw using a mouse' where the overall level of achievement is relatively similar across the three sectors—92%, 93%, 95%. Yet the contribution of the home is quite different—52%, 61%, 71%. When one looks to the advanced skills, this home-based advantage can be seen to offer a multiplier effect when combined with sector. For example, the difference in achievement of the skill 'send an email message' is quite marked—49%, 48%, 71%. Here the different contribution from homes—21%, 23%, 38%—seems to be reinforced by sector-level differences in school-based practices. Independent schools are obviously focusing on the development of these more advanced IT skills in ways that the government and Catholic systems are not, with schools contributing 18%, 14% and 27% of the initial learning opportunities for the use of email.

Core Skill	Girls			Boys		
	% have skill	where acquired % home % school		% have skill	where acquired % home % school	
Use a mouse	99	58	40	98	68	30
Save a document	95	52	43	95	62	34
Open a saved document	94	52	42	95	62	34
Draw using a mouse	93	60	31	94	64	28
Creative writing, letters etc	94	55	38	92	56	36
Move files	73	38	33	84	56	26

Use the WWW	59	20	31	72	31	27
Send an email message	48	21	20	59	29	19
Create program	44	17	24	61	30	28
Create a multimedia presentation	43	20	19	54	30	19
Make a Web site/home page	32	13	15	44	21	16

Table 3: Gender-based comparisons of skill achievement and where first acquired

There are important gender differences in achievements (see Table 3). For all basic skills, a greater proportion of boys claim to have learned these skills at home than did girls. Overall the proportion of boys and girls claiming to have achieved the basic skills was similar, with the gap being 1% (or less) for nine of the skills, and a maximum of 11% for 'move files'. For those skills where the gaps were largest, boys' claims were higher than girls, but in the nearly-equivalent skills, girls tended to be in advance of boys. For advanced skills the accomplishments were less well matched, with a greater proportion of boys than girls claiming that they both have the skills and that they were acquired at home. The trend to acquire skills at home is less evident for teachers, and, if the data for skills first acquired in pre-service settings was included, would be the opposite in all instances except playing computer games, copying games from the WWW, creative writing and creating music.

However this is by no means the complete story on this issue of access to ICT skills. The research found that students who first acquired a more advanced skill at home are more likely to 'love' using a computer *outside* their school, and to 'dislike' using a computer *at* school. Indeed, 95% of those who use computers outside of school enjoy using them. On the other hand, those who first developed a skill at school are more likely to just 'like' using computers, whether that use be inside or outside a school setting. This suggests that the issue of students' enjoyment of ICTs is linked to the uses to which those ICTs are being put, or at least to their control over those uses.

Year 10 students were asked additional questions concerning computer applications, particularly the use of email and the Internet, and attitudes towards computers. The data indicate that gender, school sector, family income and the region in which they live all influence, in predictable ways, their use of and attitudes to ICTs. That is, boys from families with higher incomes attending independent schools in the capital cities tend to be the highest users and to be most confident in that use. Further, the data indicate that those who regard themselves as more skilful in the use of these ICTs are more positive about that use, and also have best access to those technologies, ie, are more likely to own their own computer and to have access to a modem at home.

This research indicates that most of the ICT skills development of Australian students is initiated outside of formal educational settings. What are we to make of these findings? More specifically, what implications do they have for formal education more generally, and for the contribution of education to social justice and equity? In moving to address these questions I want to begin by discussing several aspects of the broader context which frame these achievements.

The end of enclosure

Debates rage as to the nature and uniformity of the broad cultural conditions that we are currently experiencing. The terms 'modern' and 'postmodern' are used to signify a sense of discontinuity between a culture underpinned by the Enlightenment project's commitment to rationality and progress, and emergent cultural practices that resist this unified and codified version of cultural advancement. Most traditional educational practices can be seen as underpinned by modernist values and thinking. This is represented in the commitment to map definitively the knowledge base that students should develop, and to organise instruction so as to achieve its efficient transmission.

The term *enclosure* is used to signify attempts by institutions to create contexts in which the occupants define the particular rules and practices that govern internal operations (Deleuze 1992). This intention is often expressed in terms of a need for operational cohesion, stability and autonomy. Traditional practices 'enclosed' schools and schooling, and through this, enhanced the degree of stability and uniformity across systems of education. In the postmodern context, Deleuze and others characterize attempts to maintain 'sites of enclosure' as failing—an outcome captured by the expression 'the end of enclosure'. The 'end of enclosure' challenges all organisational designs that rely on centralised planning, control and direction. For schools this is experienced in terms of increasing expectations that decision-making will be opened up to external influences. This is a challenge for those who administer and lead educational systems and institutions.

It is useful to think of these 'external' influences in terms of two sources: local and national. Local influences derive from the local community. Most Australian states have systematically moved to 'decentralise' their systems of education, increasing the responsibility exercised by school boards or equivalent structures of school-level governance (Chadbourne & Ingvarson 1998). In the United States this trend is evidenced in the rapid development of the 'charter school' movement (Manno *et al* 1998). Charter schools are publically funded and accountable schools which are managed by an independent committee, club or profit-making firm. Each school receives a charter to operate for a fixed term (usually five years), from a designated public authority. Manno *et al* suggest that "the genius of the charter school concept is that it is demanding with respect to results but relaxed about the means by which those results are produced" (p. 490). They also highlight the consumer-oriented nature of these new forms of school/ing, as schools become more accountable to their local communities.

The opening of schooling to external influences at a national level is most obviously manifested in the development of national curricula (Cowley & Williamson 1998)—the stimulus for the research cited in paper. In Australia, both national and state-level policies affirm an intended relationship between the broader developments of ICTs and expectations for educational practices and outcomes, particularly in terms of generic skills and work-related competencies. The relationship is seen as mutually reinforcing. For example, the document *Technology 2000: Improved learning, teaching and management through technology*, issued by the Education Department of Western Australia in November 1997, states:

IT has the potential to transform the nature of teaching and learning – to empower teachers to become mentors and facilitators and students to become independent, life-long learners. (p. 6)

The Victorian Department of Education acknowledges this relationship in terms of this potential and external demands:

The focus of the Department of Education's communication and multimedia strategy is to realise the potential of technology to enhance the quality of all aspects of education, especially student learning. To compete successfully in an information rich, technologically-enhanced and rapidly changing environment, students will need to be highly skilled and flexible in their ability to use technology in all its forms. (*Learning Technologies in Victorian Schools 1998-2001* 1998, 8)

These excerpts suggest two related requirements of schools—to transform teaching and learning through the use of ICTs, and to focus the curriculum on the achievement of generic skills and work-related competencies in all students. This policy-level consensus is consistent with that found through European research into the views of experts of the introduction of ICTs into education (Claeys, Lowyck & Van der Perre 1997).

These effects are related to several changes in the broader socio-economic context.

The socio-economic context

Several aspects of the emergent socio-economic context warrant recognition here, largely because of what they make impossible. First, within OECD economies generally, the recent decades have seen a widening spread of personal incomes, accompanied by increasing numbers of people living in poverty. Thus, there has been a decline in the distributive justice underlying the operation of national economies in the western world. In Australia this is illustrated by a real increase of 19% in the weekly earnings of the top quarter of males during the period 1975-97, while for the bottom quartile the increase was 2% (Steketee 1999). It is also illustrated by the fact that in 1995-96 the poorest quartile of taxpayers received 9.5% of total pre-tax income, while the top quartile received 47.5% of the nation's pre getting-tax income. The operation of Australia's welfare system has meant that while the rich are becoming richer, the poor have become more numerous. And we have little reason to think that social justice and equity are about to become higher priorities for those responsible for running national or global economies in this post-welfare age.

Second, the size and scope of operation of the public sector has been significantly reduced, and this reduction is reflected in a decreasing proportion of the national income used to support it. The trend has been to place a greater priority on private rather than public expenditure, including trends to privatise industries and instrumentalities that had once been publically owned and operated. The privatisation of the coal industry in Britain under the Thatcher Government is an early, and highly publicised, example of this trend. In Australia we have seen the sell-off of a range of public assets, from airports to banks to water supplies. This trend has impacted on education, where the benefits of education are increasingly seen as a private rather than a public good.

Third, OECD countries are being transformed by the rapid and pervasive expansion of a global electronic sociotechnical-economic system of enormous scope and scale (Schön, Sanyal & Mitchell 1999). This is the digital revolution, exemplified by the Internet, and strongly linked to broader economic issues such as globalisation, as well as far-reaching social and cultural issues. My focus is on social issues, specifically the potential of this revolution to exacerbate existing socio-economic inequalities, through the creation of an almost unbridgeable gap between technology haves and have-nots, a gap that is highly consistent with the existing gap between the financial haves and have-nots. I want to move to identify a number of challenges posed by these broad trends.

Reconsidering issues of equity and access

When we express a concern for equity and access, what is it that we are seeking? Advocates for the use of ICTs see them as a panacea for access. David Gray observes that the WWW "offers learners enormous opportunities for learning, including accessing information on formal educational courses, and collecting an unheard of wealth of data and information on a seemingly endless range of subjects" (1999, p. 120). Is this what we are seeking? Joseph Murphy's (1993) mapping of the evolution of the debate within the American educational system is very useful in teasing out different 'outcome spaces' for access and equity. He (p. 113) identifies three distinct but related foci for equity and access advocacy, each of which received heightened attention during specific historical periods—an evolutionary pattern. The three foci are: "equity as access to schooling"; "equity as equality of aggregated resources"; and "equity as access to learning".

The arguments that link introduction of ICTs to desired educational outcomes, including capacities for lifelong learning and work-related competencies, tend to reflect the first of these foci. That is, they equate equity with access, assuming that if all students have access to ICTs, then the principles of equity have been met. Thus, state governments congratulate themselves for linking all government schools to the Internet. However, the data from the Meredyth et al study invite a less celebratory response. They indicate that schools are not the primary site for accessing either these skills, or the 'unheard of wealth of data and information'. That is not to argue that the data suggest that schools are failing to make a contribution to this view of equity. They are particularly important for those who have least access to ICTs outside of schools—girls, rural students, students from less-affluent households, and so on. Without school-based access, these students would clearly be at risk of missing out on opportunities to develop such skills.

The central role of schools as sites of education is nevertheless in question. Where they were once the site at which key educational understandings and capacities were first encountered and engaged with, those encounters and engagements are increasingly experienced in less-formal settings, particularly the home. Educational television provides alternatives to schooling—*Sesame Street* being an almost universal example. ICTs, particularly access to the Internet, provide a rapidly expanding range of options—options for a private learning. The result is that "now learning is widely constructed as an individual activity performed by consumers who select from the educational marketplace" (Boshier, Wilson & Qayyum 1999, 276), with the Internet "probably classified as one of the most powerful and important self-directed learning tools in existence" (Gray 1999, 120). And it is being (privately) explored on a scale that is quite impressive by relatively young students, as the findings of the Meredyth et al study indicate. However, this view fails to recognise that the Internet is not an *enclosed* 'educational marketplace'. It is a *global marketplace* for anything and everything. I will return to this issue, but I want to continue to Murphy's second foci—'equity as equality of aggregated resources'.

The Meredyth et al study shows clearly that access is skewed in favour of the socio-economically advantaged. This is no surprise. And, as recent research from the United States indicates, this trend is likely to be accentuated by policy shifts which place more responsibility for school decisions with local communities. This research indicates that "school achievement in America is tied significantly to differences in school funding and child poverty at the district level" (Payne & Biddle 1999, 10). Schools in more affluent communities, irrespective of whether they are part of the state, Catholic or independent systems, are likely to receive greater financial support than those in less affluent communities. But what the Meredyth et al data also suggest is that this trend, while supported by choices parents make about where their children attend school, reflects inequities in 'aggregated resources' which include home-based resources. These two effects

compound each other—"What this means is that poor children have a *much* harder time in school than either affluent or middle-class children" (Payne & Biddle 1999, 7). The outcome is that both school funding and students socio-economic status do affect student achievement levels—"both types of inequity affect student achievement in the United States [and] such effects are largely independent [and] these effects are substantial" (p. 11).

Other research provides stark evidence on the US demographics of access to, and use of, ICTs (Bikson and Panis 1997). This shows that the rate of growth in access and connectivity is closely related to household income. Between 1989 and 1993, home-based access to computers increased from 35% to 55% for those in the top quartile of household income, while for the bottom quartile, the increase was from 6% to 7%. The authors conclude thus:

There are information society haves and have-nots; membership of these two classes is significantly predicted by income, education, and—to a lesser extent—race/ethnicity, location, and age. Except for gender gaps, these disparities have persisted over a period when the technologies of interest have decreased dramatically in price and increased markedly in user-friendliness. More worrisome still, gaps based in income and education have not merely persisted but have in fact increased significantly. There is nothing in the data, then, to suggest that, without policy intervention, these gaps will close. (Bikson and Panis 1997, 426)

In a context where most students learn most of their ICT skills at home, this inequity raises profound concerns as to the possibility of 'equality of aggregated resources'.

Murphy's third foci is 'equity as access to learning'. Elsewhere I have raised questions concerning what it is that access to ICTs provides in terms of learning—access to what (Taylor 1996, McWilliam & Taylor 1998). While Gray writes of 'an unheard of wealth of data and information' I question whether access to a massive data and information glut equates with 'access to learning'. If one accepts this equation, then one would also have to accept that access to libraries would also have provided equivalent access to learning. Yet we do not confuse access to libraries, no matter how extensive they are, with access to learning. Other authors also question what it is that we access when we log on to the WWW. Boshier et al (1999) point out that the WWW is far from a culturally neutral phenomenon—"Those living outside of North America should remember that although cyberspace seems everywhere and nowhere at the same time, its 'centre' is the USA" (p. 283). And cyberspace comes with its own cultural values and assumptions, including "its emphasis on individuals, initiative, entrepreneurship and the 'free' market" (p. 276).

The Internet is a global marketplace for anything and everything, and it comes with the values of such a marketplace. It is not a 'safe' enclosed environment, where values appropriate to learning and education are focal. This is reflected in the responses of students in the Meredyth et al study, where those who 'love' working with computers tend not to enjoy using them in the school context. If access to the Internet does provide access to learning, is that a form of learning that is recognisable in terms of school curricula? Are schools to abandon curriculum goals in order to adapt to the 'marketplace' of ideas and information that is the Internet? Is this what lifelong learning is about? Tight's (1998) research suggests that it is not. Indeed, his research suggests that the rise of corporate interest in lifelong learning has been paralleled by a restriction in the range of what is recognised as adult learning. Only those things that companies want to see developed count as 'lifelong learning'. The anarchy of the WWW does not equate with these expectations of 'equity as access to learning'.

The Meredyth et al data also points to an anti-equity multiplier effect related to school-level ICT skill development. The data shown in Table 2 suggests that computers are being used for different purposes in the Independent sector as distinct from both the government and Catholic sectors. The former seems to give greater attention to the development of advanced skills, particularly with skills related to access to and use of the Internet. These skills allow students to look beyond the 'unheard of wealth of data and information', to the development of communication skills. Perhaps this focus is only possible because so many of the students in independent schools arrive at school with well developed basic skills. On the other hand, it may reflect a more sophisticated understanding of the potential contributions of ICTs to the educational process on the part of Independent school authorities.

Implications

The findings that students are more skillful in using ICTs than their teachers, and that these skills are developed outside of school settings, are consistent with Tully's (1996) European study. But they need to be considered alongside the finding that the higher the average family income, and the greater the population density, the more likely students are to learn these skills at home. This finding is entirely consistent with those of Bikson and Panis (1997)—the urban affluent are advantaged in terms of access to ICTs, and the degree of advantage is growing. The clear implication is that current patterns of access to ICT skills generates inequitable outcomes in predictable patterns.

The nature of the disjunction between the development of ICT skills and participation in compulsory education needs to be better understood. Schools are seen to be failing to develop students' capacities for lifelong learning and their work-related competencies. The moves to restructure curricula are based on this proposition. On the other hand, for the urban affluent of our society opportunities for lifelong learning are increasingly accessible via the Internet. And the necessary skills those opportunities are being learned at home. Thus, for the most affluent, the most accessible opportunities for lifelong learning tend to lie outside of formal institutions, and outside of a public process. This is a view of lifelong learning as an essentially private achievement. This achievement need not include the concept of a public good or to the development of a civic and civil society. The latter outcomes are nevertheless espoused as central to the policy intentions of the various state and territory authorities (see, for example, the *Introduction* to the South Australian policy document, *Education for the 21st century*).

It is ironic that the organisational practices of institutional schooling may increasingly inhibit the development of the very capacities that lifelong learning both requires and cultivates. This is because the curriculum-as-implemented has evolved into a scheduling device for classes and subjects rather than a program for learning.

A focus on subjects is more likely to organize school time into 45-minute periods and student learning into neat bits (to be assimilated unquestioningly by students) than to provide apprenticeships in understanding and complex problem-solving relevant to the real world. (Rogers 1997, 685)

Indeed, as the potential for ICT-facilitated learning rapidly expands, the purpose and value of compulsory education, may be increasingly questioned, especially by those whose self-directed learning is interrupted through schooling experienced primarily in terms of confinement, behavioural and emotional training.

Conclusion

The emergent nature, wide availability and use of ICTs poses particular challenges for policy makers, and particularly for policies which rely on education as a means to promote social justice and equity. The increasing *inequity* of access to ICTs outside of formal educational settings suggests that education may represent an opportunity to re-level the playing field. This calls for quite specific programs of compensatory investment so as to ensure that those who have least access out of schools are given very high quality access within them. However, as indicated in the preceding discussion, there are a number of reasons for profound pessimism about the possibility that current or future policy prescriptions might lead to more equitable access, ie, one that offers more equitable access to learning. There is no evidence to suggest that the socio-political environment will make the enunciation and enactment of such policies possible in the near term.

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