A matter of equity: computers in Australian homes

This paper discusses the results of a number of recent studies that have investigated different aspects of computer use in Australian households. The combined findings of these studies provide Australian educators, for the first time, with comprehensive empirically grounded data upon which to base their thinking about the changing lives of the children they teach. The paper ends with a brief discussion on some of the equity issues arising out of these findings.

Introduction

There is much media speculation that computers are becoming widespread in Australian society and in children’s lives, particularly in their homes (e.g. The Age 16/4/96, The Canberra Times, 15/4/96, West Australian 10/4/96). Teachers are continually being urged by both parents and politicians to recognise this significant change in the lives of many of their students and to integrate computing into their classroom teaching and learning activities as a response to these changes.

To date, little information has been available that describes Australian children’s access to and use of computers in their homes. A number of studies (Apple Computer Australia Pty Ltd, 1996; Australian Bureau of Statistics, 1996; Cupitt & Stockbridge, 1996; Downes, 1995,1996 & 1997) have recently been undertaken in Australia that, when combined provide a rich description of what is happening. The results of these studies are analysed and discussed in this paper. This provides teachers with information about the nature and variety of the home experiences of their students with regard to computing. In turn, this provides a sound basis for making decisions about the use of computers in schools.

In the ensuing discussion, the studies (Apple Computer Australia Pty Ltd, 1996; Australian Bureau of Statistics, 1996; Cupitt & Stockbridge, 1996; Downes, 1995,1996 & 1997), are abbreviated as Apple, ABS, ABA and Downes respectively. ABA refers to the Australian Broadcasting Authority study authored by Cupitt & Stockbridge. Much of the ABS data presented in this paper has not been previously published. When such data is referred to, an endnote indicates the source of the data.

Computers In Australian Households

Compared with other OECD countries, Australia in 1994 was a relatively high ownership country with 23% of Australian households owning computers (Australian Bureau of Statistics, 1996). The penetration of computers into Australian households was less than the USA (37%) and Germany (28%), about equal to the United Kingdom (24%) and more than France (15%) and Japan (12%).

Household Ownership

From 1994 to 1996 there was significant growth in the household use of computers in Australia (Australian Bureau of Statistics, 1996). Listed below are some of the findings:

• Computer usage in private households in Australia increased from 23% to 30%;
• The total number of computers in households increased from 1.9 to 2.5 million;
• The percentage of computer-owning households with printers remained reasonably static, increasing marginally from 80% to 82%;
• The percentage of computer-owning households with CD-ROM equipment increased substantially from 13% to 41%;
• The percentage of computer-owning households with modems increased slightly from 17% to 23%.

A number of the studies (Apple Computer Australia, 1996; Australian Bureau of Statistics, 1996; Cupitt & Stockbridge, 1996) have identified variables that are linked to household ownership such as geographical location, income, level of education, type of employment, and the presence of children. For example the ABS study found that 33% of households in capital cities have computers compared to 24% in the remainder of Australia. The Apple study
reported 43% of households with adult white-collar workers owned computers relative to 26% with blue collar workers. All of the studies confirmed that ownership was strongly linked to income. There was also a strong relationship between children and the presence of computers in the home. This relationship is discussed below.

Patterns Of Ownership In Households With Children

All of the studies found that children in a household increased the likelihood of that household owning a computer, and that this likelihood increased with the ages of the children. The ABS (1996) and Apple (1996) studies found that 47% of households with dependents had computers; the ABA study (Cupitt & Stockbridge, 1996), found 59% for children between the ages of eight and seventeen; and a Reark Research study (cited in Cupitt & Stockbridge, 1996) found 55% for six to eleven year olds and 60% for twelve to seventeen year olds.

Some of the studies focused on other factors related to computer ownership in homes with children. Unpublished data from the Australian Bureau of Statistics (1996) is presented in Table 1 below. It shows a strong relationship between income and computer ownership.

Both the ABA (Cupitt & Stockbridge, 1996) and Apple (1996) found a link between ownership and the level of education of parents. The former study reported 75% penetration in households with parents with tertiary educational levels compared to 61% with technical education and 47% with secondary education levels.

Family type was also linked to ownership. The ABS (1996) found a significant but lessening gap between two-parent families (45%) and single-parent families (30%). The figures in 1994 were 38% and 20% respectively.

Ownership Of Other Computing Equipment

The ABS (1996) found that of those families with dependents that used computers, 86% had printers, 50% had CD-ROM equipment, 23% had modems and 12% had scanners or other equipment.

There is also a growing number of homes with more than one computer. Estimates varied between 6% and 10% (Cupitt & Stockbridge, 1996; Apple Computer Australia Pty Ltd, 1996; Downes, 1996). Downes (1996) found that the ownership of additional computers and some of the more recent and expensive peripheral equipment was linked not only to family income but also to the presence in families of parent/s who used a computer as part of their employment or business.

Table 1:
Computer using Households with Dependent by Household Income

<table>
<thead>
<tr>
<th>Household Income ($)</th>
<th>% of households using computers in February 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 14 000</td>
<td>23.0</td>
</tr>
<tr>
<td>14 001 - 27 000</td>
<td>29.1</td>
</tr>
<tr>
<td>27 001 - 44 000</td>
<td>39.5</td>
</tr>
<tr>
<td>44 001 - 66 000</td>
<td>54.1</td>
</tr>
<tr>
<td>66 001 &amp; over</td>
<td>70.1</td>
</tr>
</tbody>
</table>

Users Of Household Computers

Within the home there is a range of factors which influences who uses the computer, what it is used for, and how often it is used. Two key factors are age and gender.

Both the Apple (1996) and the ABS (1996) studies found that the percentage of household members actually using computers increased with age till the mid teens and then decreased to adulthood. Figure 1 presents the previously unpublished data from Australian Bureau of Statistics3 broken down by age and gender.

For young children, the percentage of boys (32.6%) was higher than the percentage of girls (28.7%). In the older age groups of children the difference was minimal (47.5% - 47.0% and 49.3% - 48.1%), but from young adulthood the gender differences began to increase again. These gender differences were more pronounced when household members were attributed with ‘being the person who uses it most’. All age groups of males were much more likely than their age cohort females to be considered as the person who uses the computer the most (Apple Computer Australia, 1996, and Downes, 1996).

Types of Uses

Table 2 presents unpublished data from the Australian Bureau of Statistics (1996) study broken down by age and gender. This study identified game playing, educational/study purposes and work-related activities as the most common broad categories of use. The use of online services, email or the Internet was rare, consistent with the low level of modem ownership in Australian households.
In each of the age groups a greater percentage of boys than girls used the computer for games while the converse applied for educational and study-related purposes, although, the gender differences were minimal in the latter case.

The percentage of girls and boys who used the computers for games increased then decreased with age. The number of girls peaked in the 10-14 year range and then decreased while the number of boys remained at a peak through 10-17 years before declining. Similarly the percentage of girls and boys who used the computers for educational and study-related purposes increased with age, but both remained at a peak through 10-17 years.

A significant finding was that overall, more children used the computer for educational and study-related purposes than for game playing in each age group except for the youngest.

Table 2 also distinguishes ‘main’ use from ‘any’ or overall use. Main use is defined as the principal or most common computer activity as indicated by the respondent. When the main use rather than the overall use was analysed the situation became more complex. Age and gender differences were much more pronounced. Figure 2 highlights these differences in graphical form.

In general, a greater percentage of boys reported their main use as game playing rather than educational or study-related. The percentage of boys whose main use was game playing peaked at 10-14 years of age and then declined. The percentage whose main use was educational or study-related did not peak until 15-17 years of age, and the peak was at a somewhat lower level than that of the game playing.

A different pattern emerged for the girls, with a greater percentage of girls in all age groups, apart from the youngest group, having educational and study-related uses as their main use of the computer. Again the percentage increased with age, with game-playing peaking at 10-14 years at a much lower level than educational and study-related uses which peaked later at 15-17 years of age.

Downes (1996) also found that the type of ‘non-game’ activities varied with age and with gender. While both older boys and girls (ten to twelve years) were equally likely to use the computer for school-related activities, boys were less likely to engage in ‘non-game’ leisure activities such as drawing, designing and writing narratives.
Time Spent on Different Types of Uses

Tables 3 and 4 present the Australian Bureau of Statistics (1996) data on the patterns of average weekly time spent playing games. A number of important findings arise from this data.

Firstly, from Table 3 it is evident that the large majority of game-playing household members spent between zero and five hours a week playing games. This contrasts with television watching where the average has been reported as exceeding fourteen hours a week (Cupitt & Stockbridge, 1996, p21). Even for males in the age range 10-24yrs, the group identified in popular media as the enthusiasts and addicts, less than 10% play games for more than ten hours a week.

Secondly, while the majority of female household members also spent an average of one to five hours a week playing games, they spent less time overall than their equivalent male age cohorts. Very few female household members played games on average more than ten hours per week.

Thirdly, from Table 4 it is clear that there were household members in all age groups whose only computer activity was game playing. The percentages of these household members are presented in the column headed: None. A large proportion of these were young children of both genders. Furthermore, males exceeded females in each age group.

Fourthly, the majority of children (5-17 yrs) used the computer for non-game playing activities on average for one to five hours per week. It is worthy of note that this parallels the average amount of time spent playing games, although the percentage doing so is less.

Finally, in contrast to differences in patterns of time spent playing games, gender differences with time spent on non-game activities were almost reversed in the sense that female household members spent more time than their male counterparts using the computer for non-game playing activities. Only in the adult age group did this pattern break down, with males spending more time than females.

Table 3 Per cent age of Population who spend time playing games

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Less than 1 hr</th>
<th>1-5 hrs</th>
<th>6-10 hrs</th>
<th>10 + hrs</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>male</td>
<td>11%</td>
<td>71%</td>
<td>14%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>17%</td>
<td>76%</td>
<td>6%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10-14</td>
<td>male</td>
<td>8%</td>
<td>67%</td>
<td>17%</td>
<td>6%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>18%</td>
<td>69%</td>
<td>11%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>15-17</td>
<td>male</td>
<td>12%</td>
<td>59%</td>
<td>18%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>28%</td>
<td>58%</td>
<td>12%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>18-24</td>
<td>male</td>
<td>12%</td>
<td>56%</td>
<td>20%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>24%</td>
<td>63%</td>
<td>7%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>25+</td>
<td>male</td>
<td>19%</td>
<td>60%</td>
<td>13%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>22%</td>
<td>62%</td>
<td>11%</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table 4 Per cent age of Population who spend time on non-game activities

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>None</th>
<th>Less than 1 hr</th>
<th>1-5 hrs</th>
<th>6-10 hrs</th>
<th>10 + hrs</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>male</td>
<td>36%</td>
<td>19%</td>
<td>40%</td>
<td>4%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>24%</td>
<td>21%</td>
<td>50%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>10-14</td>
<td>male</td>
<td>15%</td>
<td>15%</td>
<td>57%</td>
<td>9%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>9%</td>
<td>10%</td>
<td>67%</td>
<td>10%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>15-17</td>
<td>male</td>
<td>8%</td>
<td>10%</td>
<td>52%</td>
<td>18%</td>
<td>11%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>3%</td>
<td>6%</td>
<td>60%</td>
<td>22%</td>
<td>8%</td>
<td>1%</td>
</tr>
<tr>
<td>18-24</td>
<td>male</td>
<td>11%</td>
<td>7%</td>
<td>42%</td>
<td>18%</td>
<td>20%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>3%</td>
<td>6%</td>
<td>48%</td>
<td>28%</td>
<td>14%</td>
<td>1%</td>
</tr>
<tr>
<td>25+</td>
<td>male</td>
<td>6%</td>
<td>5%</td>
<td>44%</td>
<td>23%</td>
<td>22%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>5%</td>
<td>7%</td>
<td>54%</td>
<td>18%</td>
<td>13%</td>
<td>13%</td>
</tr>
</tbody>
</table>

These five trends are important as they help define the socio-cultural contexts of children’s household computing in terms of the age and gender patterns of role models and the expertise-based support available. They also present the differences in children’s patterns of uses in the context of other household members’ uses.

Downes (1995 and 1996) also found a number of other factors that influenced the use of computers by children in homes. These included the location of the computer and the rules about its use.

Computers were located in either a public or a private space. The public space, such as the family room or the living room, predominated. The private space was usually a parent’s study or an adolescent’s bedroom. It was rarely the bedroom of a child under twelve. It was common for these private spaces to belong to male parents and adolescents. In these private spaces access and use often needed to be negotiated with the owner of the space. As well, some of the computers in public spaces were perceived by the children to ‘belong’ to a particular family member. More often that not, it was a male member who seemed to ‘own’ the computer. Sometimes this ‘ownership’ also led to negotiated use.

A range of rules existed around the computer. These included how often, for how long and for what purpose children could use the computer. The existence of
rules, both explicit and implicit (such as those defined through the ways that conflicts were handled), lead to differential access in terms of age, that is, older family members had priority over younger members. Those doing work also had priority over those using the computer for recreation. This latter rule seemed to facilitate female use of the computer for it gave girls who were doing school or study-related work, priority access over game-playing family members, who were more likely to be boys.

**Educational implications.**

The main issue to arise from the results of these recent Australian studies is one of equity. Equity is used here in the broadest sense that "all" children have the right to have their needs and interests taken into account by the education system. Hence children in any of the following groups have a right to expect that their needs and interests will shape policy and practice in their schools and their classrooms. These groups are:

- Children who don’t have access to computers in their homes;
- Children who do use computers in their homes;
- Children who are regular and expert game players;
- Children who are regular and expert ‘tool’ users; and in the future
- Children who are regular and expert Internet users.

Some of the issues for each of these groups will be discussed below.

**Children Who Don’t have Access to Computers in their Homes**

There are two main educational issues associated with children who do not have access to computers in their homes. The first issue stems from emerging research findings that, in some computer-integrated classrooms and schools, inequalities arising from children’s lack of access to computers in their homes are promoted and even augmented through these children’s lack of participation in school computing. DeVillar and Faltis (1991) found that the factors relating to differences in participation and benefit were not only pertaining to the technology or the children’s existing confidence and competence with the technology, but to the general classroom culture, group dynamics, and the way teaching and learning was organised. It is noteworthy that these are the same factors so often quoted in research focusing on gender inequalities with technology in schools (Sutton, 1991).

In the Downes (1995, 1996) study of primary school children many of the children were critical of the organisation and management of the classroom use of computers, including situations where boys were allowed to hog the computers. Interestingly, even some of the very competent and confident home-computer-using girls described how they opted out of using computers in their classrooms because of the competition.

The second issue relates to the development of computing skills and confidence in children who do not have access to computers outside of the classroom. The main difficulties relate to finding time for these children to explore the use of the computer, to engage in purposeful tasks on their own and to practise new skills.

To address both of these issues requires attention to a wide range of resource, curriculum, management and organisational decisions at the school and the classroom level.

**Children Who Use Computers in their Homes**

It is equally important that teachers do not use a reverse equity argument to continue the practice of failing to recognise and capitalise on the skills and understandings that some children bring to school because they use computers in their homes. It is difficult to justify a position based on the reverse equity argument that children with computers in their homes would have an unfair advantage. The fallacy of this argument is obvious if an analogy is drawn with print-based literacy processes and artefacts: Would any teacher ignore children who come to school already being able to read or write, or feel they were cheating if they spent extra time reading their own books at home?

Equally important is the issue of how difficult it is in the minds of many teachers to separate the contribution of the child and the computer to the final product of a learning experience, particularly one completed away from the classroom. While issues to do with plagiarism are real and important, they existed long before ‘cutting and pasting’ from CD-ROMs and the Internet were possible. The real issue rests with the identification of the purposes or intended outcomes of the learning embedded within the assignment and the development of effective ways to assess both the processes and products of learning.

**Children who are Regular and Expert Game Players**

The issues surrounding children in this group are twofold: Do these children have a different world view because of their game playing; and do they develop different learning capacities because of these experiences? While there are no simple answers to either of these questions both deserve serious attention by teachers.

In relation to the first question, a recent review of the research literature on game playing reveals that the strong negative claims about game playing cannot be supported. Durkin found that game playing “has not produced a generation of isolated, antisocial, compulsive computer users with strong propensities for aggression” (Durkin, 1995). Even so, there still remains concern about the content of popular games, particularly the violence and to a much lesser extent the gender bias (Provenzo, 1991). Concern about exposure to this type of content needs to be viewed within the broader context of popular culture and social change. Rarely do teachers take time to reflect on the popular culture of the young and how it is changing the social contexts and lives of today’s students or to recognise it as a legitimate source of experiences upon which to build classroom learning.

With regard to the second question, there is little research that addresses the impact of regular game playing on learning capacities. Heppel
(1996) in his writings argues that today’s children do have different capacities for learning, but he links these capacities to the impact of multimedia (including television) on children.

What is well known about games is that children are drawn to repeated game playing because of the elements of challenge, control, fantasy and curiosity (Baird & Silvern, 1990; Smith, Curtin & Newman, 1996). This is not an argument for packaging bits of learning into electronic games, but rather for including elements such as challenge and control in classroom learning tasks and experiences.

Children who are Regular and Expert ‘Tool’ Users

Many of today’s parents and teachers believe that becoming competent in today’s communication and information handling technologies is an important part of education. These same parents and teachers also stress the importance of maintaining a strong repertoire of skills in the world of print and print-based technologies (Downes, 1997). These dual beliefs impose the expectation of ‘bi-literacy’ on children, that is, they need to operate effectively in both the print and the electronic world.

An in depth study of 12 children who used computers in their homes found that those children who were regular and expert users of software such as word processors, desk-top-publishing software, multimedia information texts and the Internet had developed their expertise at home through their own personal interest and the support of another ‘expert’, usually a family member (Downes, 1997). These dual beliefs impose the expectation of ‘bi-literacy’ on children, that is, they need to operate effectively in both the print and the electronic world.

Children who are Regular and Expert Internet Users

While relatively few students in today’s classrooms are regular and expert Internet users, the numbers will grow dramatically and create issues for teachers in the near future. Two different features of the Internet are important when considering any issues. These are the ability to access an almost unlimited source of information, and to communicate without regard to distance, time and the nature and status of the correspondents.

There is little research which can illuminate issues associated with children who are regular and expert Internet users because it is so recent a phenomenon. One could speculate though, that these children will be increasingly frustrated with the limitations of classroom walls and timetables, minimal expertise within the school staff and resources within the library, and the limiting of learning communities to their fellow students and teachers. All of these will continue to be a barrier to self-initiated learning.

Conclusions

The analysis of the national data clearly indicates there are children from particular groups within the Australian community who are more likely to come to school without home computing experiences. These children come from the less affluent families, rural communities, single parent families and families without some parental experience in computing.

...there are children from particular groups within the Australian community who are more likely to come to school without home computing experiences. These children variously met from their teachers recognition, encouragement, denial and in some cases resistance to their highly developed computer skills and personal preferences. While the levels and organisation of resources were critical when providing these learners with computing resources when needed or sought, the attitudes and beliefs of the teachers also had a dramatic impact on the way they used computers to benefit their own learning and the learning of others in their classes.

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Conclusions

The analysis of the national data clearly indicates there are children from particular groups within the Australian community who are more likely to come to school without home computing experiences. These children come from the less affluent families, rural communities, single parent families and families without some parental experience in computing. For the children who do have computers at home there are significant gender differences in the ways that they are used. In particular, boys and girls differ in the level of game playing and the use of the computer for educational and study-related purposes.

Home use does impact on school access and is gender related. Whatever the home use background of the children, equity principles demand that all children receive real consideration when system, school and classroom policies and practices are being developed, if for no other reason than not further exacerbating the differences in participation in school computing.
Both the effective use of technology in teaching and learning as well as the development of ‘bi-literacy’ in all children require that schools and teacher seriously address the types of issues that stem from the different ways children use computers in their homes and the skills they develop from this use. While the trends from the national data are useful background information, teachers and schools really need to investigate their own students home experiences, and the popular culture within which these experiences are situated so that they can effectively tailor any strategies that might be developed.

Resource provision and management will undeniably play a major role in meeting the needs and interests of all students in the school. However, the vital importance of teachers attitudes, beliefs, understandings and skills cannot be underestimated. At the minimum teachers need to appreciate just how much the lives of some of their students differ from their own experiences at the same age, and how the gap between the electronic world of entertainment and ‘home’ work differs from the classroom where ‘school’ work is still mainly ‘trapped’ in the world of print.

1 All numbers and percentages from the Australian Bureau of Statistics are based on population estimates and have standard error of less that 25%.
2 The data in this table was calculated from data in an unpublished table obtained from the ABS called: Households frequently using computer by family type and income, 1996, controlling for households with dependents.
3 The data in this table was calculated from data in an unpublished table obtained from the ABS called: Count of persons aged 5 years and over using household computers by age and sex, 1996.
4 The data in this table was calculated from data in two unpublished tables obtained from the ABS called: Activities of household computer users by age and sex, 1996; and Main activities of household computer users by age and sex, 1996.
5 The data in this table was calculated from data in two unpublished tables obtained from the ABS called: Average hours spent per week using computers to play games by age and sex, 1996.
6 The data in this table was calculated from data in a series of unpublished tables obtained from the ABS called: Average hours spent per week using computers for non-game activities by age and sex, 1996.

REFERENCES
