MCEECDYA

National Assessment Program – ICT Literacy Years 6 & 10 Report

2008

MCEECDYA
Ministerial Council for Education,
Early Childhood Development and Youth Affairs

NATIONAL ASSESSMENT PROGRAM

ICT Literacy
Years 6 and 10 Report 2008

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Early Childhood Development and Youth Affairs

The Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEECDYA) was established on 1 July 2009, following agreement of the Council of Australian Governments (COAG) to a realignment of the roles and responsibilities of two previously existing councils - the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) and the Ministerial Council for Vocational and Technical Education (MCVTE). This decision has resulted in the formation of two new Councils - MCEECDYA and the Ministerial Council for Tertiary Education and Employment (MCTEE).

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Foreword

This report presents the findings from the National Assessment Program – ICT literacy assessment conducted in 2008 under the auspices of the national council of education ministers, the Ministerial Council for Education, Early Childhood Development and Youth Affairs (MCEECDYA).

National samples of Year 6 and Year 10 students were assessed to determine their levels of confidence, creativity and skill development in the use of information and communication technologies.

This report compares the results of Australian school students by state and territory and student sub-groups, and provides details of their achievement against an ICT literacy scale. It also enables the most recent achievements of students to be compared against those from the first national assessment of ICT literacy conducted in 2005. A survey of student access to, and use of, computers was conducted as part of the ICT literacy assessment and it provides an interesting insight into how students are using their access to new technologies.

Principals, teachers and students at Government, Catholic and independent schools around Australia are to be commended for their participation in the assessments, and for the valuable information about ICT literacy in schools that their efforts have provided.

Particular thanks go to members of the Performance Measurement and Reporting Taskforce and to its Benchmarking and Educational Measurement Unit, the official bodies responsible for developing and administering the assessments on behalf of MCEECDYA, and to the national committees of curriculum and other experts who provided advice.

A Technical Report will be made available to researchers, and a set of School Release Materials for teachers to use within the classroom.

I commend this report to Members of Parliament, teachers, educators and the community, as it provides valuable information on students' abilities to access, synthesise and present information as well as determining their understanding of the impact of these information communication technologies on society.

Julie Grantham
Chair
Performance Measurement and Reporting Taskforce

Executive Summary

Australia's national educational goals place considerable importance on the place of ICT in education. The Melbourne Declaration on Educational Goals for Young Australians of December 2008 asserted that "in this digital age young people need to be highly skilled in the use of ICT" (MCEETYA, 2008). This assertion continued a theme from the earlier Adelaide Declaration of Australia's National Goals for Schooling (which were still operative at the time of the present survey – NAP-ICTL08) which stated that when students left school they should be: "confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society" (MCEETYA, 1999).

This current report is based on the second cycle of national assessments of ICT Literacy (NAP-ICTL08) which was conducted in October 2008. It provides information about ICT literacy among Australian school students in 2008 and reports changes in ICT literacy between 2005 (the time of the first cycle) and 2008. It reports on ICT literacy overall and for particular groups of students. The assessment made use of the computer-based assessment tool that been developed for the 2005 survey and extended this approach to performance assessment to embrace some new developments. The assessment survey was conducted in a nationally representative sample of 10,926 students from Years 6 and 10 in 591 Australian schools.

Definition of ICT Literacy

Prior to the first cycle of assessment of ICT Literacy the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) defined ICT

Literacy as "the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society" (MCEETYA, 2005). The framework that elaborated this definition referred to six key processes in ICT Literacy: accessing information; managing information; evaluating information; developing new understandings; communicating; and using ICT appropriately. This view of ICT literacy emphasised the interaction of information literacy with computer technology. Since 2005 ICT literacy has become increasingly regarded as a broad set of generalisable and transferable capabilities that are used to manage and communicate cross-disciplinary information using computer technology. The integration of information and technology is seen to transcend the application of ICT within any single learning discipline.

Assessment Method

A key aspect of the assessment of ICT literacy in Australia has been that it is designed as an authentic performance assessment. The assessment instrument was designed to mirror students' typical 'real world' use of ICT. Students completed tasks on computers using software that included a seamless combination of simulated and live applications. Some tasks were automatically scored and others (those that resulted in information products) were stored and marked by human assessors. The tasks (items) were grouped in thematically linked modules each of which followed a narrative sequence covering a range of school-based and out-of-school based themes. Each module typically involved students collecting and appraising information as well as synthesising and reframing the information. The assessment involved a number of modules so as to ensure that the assessment instrument assessed what was common to the ICT Literacy construct across a sufficient breadth of contexts.

The format of the ICT literacy assessment in 2008 was the same as in 2005 in that the appearance of material was identical and the method of responding to tasks and saving information products was exactly the same. The assessment instrument used in 2008 was linked to that used in 2005 by the inclusion of three common modules that covered different aspects of the 2005 assessment (general skills, a piece of unfamiliar software and tasks using common utilities). The assessment in 2008 included four new modules associated with more interactive forms of communication and assessed issues involving responsible use of ICT more extensively than 2005. Each student completed two of these modules as well as two modules from the 2005 assessment.

Delivering the Assessments

For the 2008 cycle there was a change in delivery mode so as to make more use of school computers but in a way that did not affect the student's experience of the assessment. The 2008 cycle made use of school computers in 86 per

cent of the sampled schools. This was either by providing the school with a laptop computer containing the assessment software and database that could be connected to the school network and function as a server (68 per cent of all schools) or by connecting to a remote server farm through an Internet connection (18 per cent of all schools). In only 14 per cent of schools was it necessary to provide a computer mini-lab (nine student notebooks connected to a higher specification notebook server) which had been the sole delivery method in the 2005 cycle. In addition the applications functions in the new modules in 2008 were based on Open Office rather than MS Office to provide a basis for the free distribution of school release materials.

ICT Literacy in 2008

Linking performance across modules, Year levels and cycles

Item response modelling (the Rasch model) was used to analyse the pattern of student responses (which items and how many items they successfully completed). A benefit of using Rasch model as a basis for the analysis was that the difficulty of all the tasks in the assessment and the performance of all students who participated in the study could be placed on the same scale. A further benefit was that the Rasch model could be used to equate scores from the different modules completed by students even though individual students completed different combinations of modules. The difficulties of all the tasks in each module could be placed on the same scale because there were sufficient students completing each possible combination of modules.

The assessment instrument contained seven modules of which each student completed four. Six of the modules were for students from either Year 6 or Year 10 and one, a more sophisticated and challenging module, was only available to Year 10 students. Across the modules there were 107 tasks common to both Year levels and potentially available for comparing the relative performance of the Year 6 and Year 10 students (although only 37 tasks were used in practice). Three assessment modules from NAP-ICTL05 were included in the 2008 assessment along with four new modules. Rasch analysis enabled the new items to be placed on the established ICT literacy scale. Consequently this enabled the results from NAP-ICTL08 to be compared directly with those from NAP-ICTL05 [1]. In practice 39 items had performed sufficiently uniformly across both cycles to be used to link the results of the 2008 study to the ICT literacy scale established in 2005.

1 The three modules that had been used in 2005 were the General Skills Test (GST), Photo Album (PHA) and DVD Day (DVD) (MCEETYA, 2007).

ICT literacy scale

A reporting scale for ICT Literacy was established in 2005 with the Year 6 cohort being defined as having a mean scale score of 400 and a standard deviation of 100 scale score units. The Year 10 mean and standard deviation in 2005 were determined by the performance of Year 10 relative to the Year 6 parameters. For Year 10 the mean was 551 and the standard deviation was 98. Using the equating procedure outlined above it was possible to record the results for NAP-ICTL08 on the scale that had been established in 2005. In 2008 the Year 6 mean was 419 (with a standard deviation of 115) and the Year 10 mean was 560 (with a standard deviation of 107).

Table ES1: ICT Literacy Proficiency Level Descriptions 2008

Level	Proficiency level description	% Yr 6	% Yr 10
6	Students working at level 6 create information products that show evidence of technical proficiency, and careful planning and review. They use software features to organise information and to synthesise and represent data as integrated complete information products. They design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work.	0.0	1.1
5	Students working at level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products.	1.0	18.2
4	Students working at level 4 generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this.	15.1	46.7
3	**Proficient Standard Year 10** Students working at level 3 generate simple general search questions and select the best information source to meet a specific purpose. They retrieve information from given electronic sources to answer specific, concrete questions. They assemble information in a provided simple linear order to create information products. They use conventionally recognised software commands to edit and reformat information products. They recognise common examples in which ICT misuse may occur and suggest ways of avoiding them.	40.6	25.6
2	**Proficient Standard Year 6** Students working at level 2 locate simple, explicit information from within a given electronic source. They add content to and make simple changes to existing information products when instructed. They edit information products to create products that show limited consistency of design and information management. They recognise and identify basic ICT electronic security and health and safety usage issues and practices.	30.3	6.9
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	13.0	1.5

ICT literacy profile

It was also possible to describe students' ICT literacy in terms of proficiency levels. Six Proficiency Levels were defined in NAP-ICTL05 and descriptions, based on the content of the tasks corresponding to the difficulty range in each level, were developed to characterise typical student performance at each level. As a set, the descriptions represent growth in ICT literacy. The levels are not discrete discontinuous steps but are a method of representing progress. The newly developed assessment modules for NAP-ICTL08 enabled the detailed ICT literacy proficiency descriptors to be updated with some new examples of ICT literacy achievement. The texts of the proficiency level descriptions established in NAP-ICTL05 remain valid and are shown in Table ES 1. The cut scores for each proficiency level were defined in 2005 and those same cut-scores were applied to the 2008 data. Figure ES 1 shows the distribution of ICT Literacy across the six proficiency levels described. These data show that overall Year 10 students are operating approximately one proficiency level higher than Year 6 students across the scale. The separation of Year 6 and Year 10 students is shown in Table ES1. Only 16 per cent of Year 6 students performed at Level 4 or above compared to 66 per cent of Year 10 students. In contrast 43 per cent of Year 6 students performed at Level 2 or below compared to eight per cent of Year 10 students.

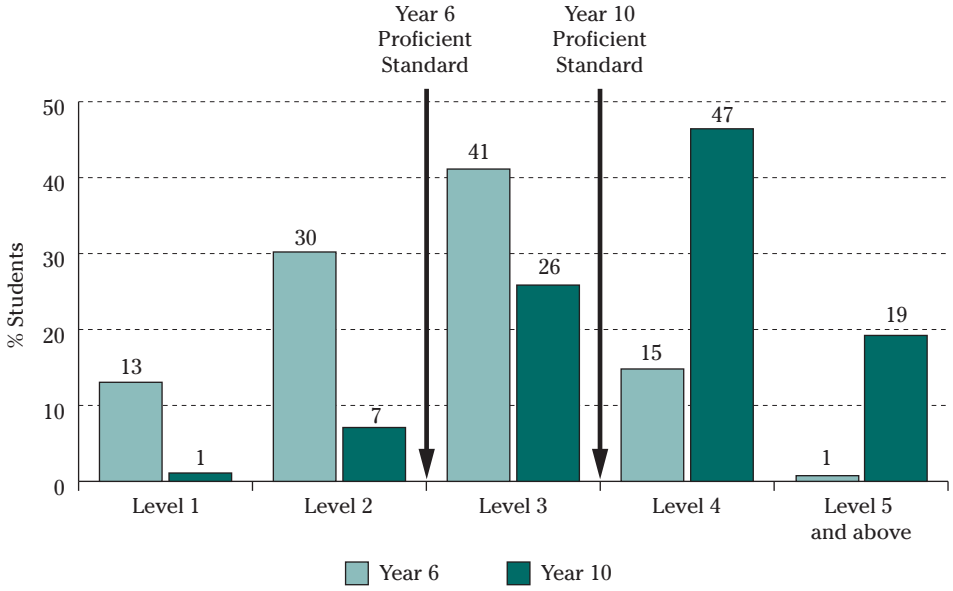


Figure ES1: Distributions of ICT Literacy across Proficiency Levels in 2008

Proficient standards in ICT Literacy

In addition to deriving the ICT literacy proficiency scale, proficient standards were established in 2005 for Year 6 and Year 10. The proficient standards represent points on the proficiency scale that represent a 'challenging but reasonable' expectation for typical Year 6 and 10 students to have reached by the end of each of those years of study. The proficient standard for Year 6 was defined as the boundary between levels 2 and 3 and the proficient standard for

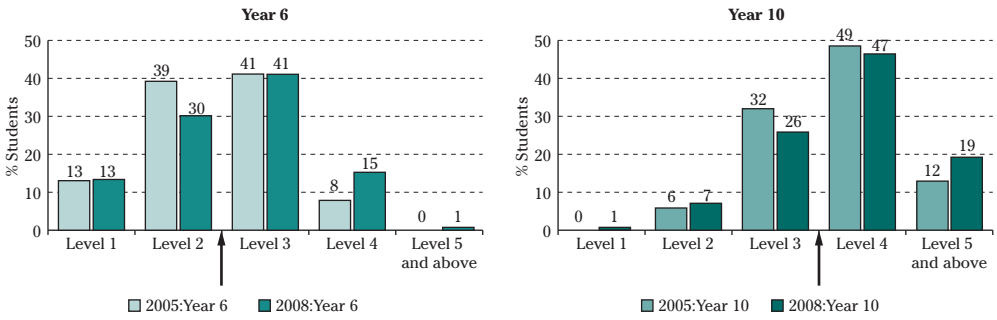
Year 10 was defined as the boundary between levels 3 and 4. These proficient standards have been shown on Figure ES1.

In 2008, 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard by demonstrating the ability to "generate simple general search questions and select the best information source to meet a specific purpose, retrieve information from given electronic sources to answer specific, concrete questions, assemble information in a provided simple linear order to create information products, use conventionally recognised software commands to edit and reformat information products". In 2008, 66 per cent of Year 10 students reached or exceeded the Year 10 proficient standard by demonstrating the ability to "generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose, create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose".

Changes in ICT Literacy from 2005 to 2008

There was a statistically significant increase in the mean score for Year 6 students between 2005 and 2008 from 400 to 419 scale points. For Year 10 the increase from 551 to 560 scale points was not statistically significant.

The change from 2005 to 2008 can also be expressed in terms of the percentage of students who attained the proficient standard. In 2008 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard compared to 49 per cent in 2005. Correspondingly, 66 per cent of Year 10 students in 2008 reached or exceeded the Year 10 proficient standard compared to 61 per cent in 2005. The increase for Year 6 was statistically significant but that for Year 10 was not statistically significant.



Note: Proficient standard for each Year level is designated with an arrow.

Figure ES2: Distributions over Proficiency Levels in 2005 and 2008

Patterns of ICT Literacy

Differences among jurisdictions

In the report, differences in the mean ICT literacy scores are analysed in detail (including changes in mean scores from 2005 to 2008). In terms of mean scores for Year 6 in 2008:

- The mean score for the Australian Capital Territory was significantly greater than that for all jurisdictions except Victoria;
- The mean scores for the Australian Capital Territory, Victoria and South Australia were significantly higher than the means for the remaining jurisdictions;
- The mean score for New South Wales was not significantly different from the means for Tasmania, Western Australia or the Northern Territory; and
- The mean score for New South Wales was significantly higher than the mean score for Queensland.

Table ES2: Mean ICT Literacy Scores by Jurisdiction for Year 6 and Year 10 in 2008

	Mean Score	Confidence Interval	Increase (2005 - 2008)
Year 6			
Australian Capital Territory	**471.6**	±13.9	Yes
Victoria	**447.0**	±15.1	Yes
South Australia	**438.5**	±12.5	Yes
New South Wales	412.8	±14.5	No
Tasmania	408.0	±16.4	No
Western Australia	403.4	±11.5	Yes
Queensland	**392.2**	±11.8	Yes
Northern Territory	**364.1**	±49.8	No
ALL	**418.7**	**±6.9**	**Yes**
Year 10			
Australian Capital Territory	**597.9**	±14.5	Yes
Victoria	568.7	±18.1	No
New South Wales	563.5	±13.7	No
South Australia	560.2	±11.5	No
Western Australia	559.3	±12.1	Yes
Queensland	548.5	±14.0	No
Tasmania	539.2	±16.3	No
Northern Territory	**466.3**	±71.5	No
ALL	**560.0**	**±7.1**	**No**

Notes: Increase (2005 to 2008) refers to a change between cycles that was statistically significant. Scores shown in bold are significantly different from the national mean

For Year 10 there were fewer differences among jurisdictions.

- The mean score for the Australian Capital Territory was significantly higher than those for all other jurisdictions;
- The mean scores for Victoria, New South Wales, South Australia, Western Australia and Queensland were not significantly different from each other; and
- The mean score for Tasmania is lower than the mean scores for the Australian Capital Territory, Victoria, New South Wales and South Australia but is not significantly different from Western Australia, Queensland or the Northern Territory.

The mean score for the Northern Territory is substantially lower than the next lowest jurisdictional score but this does not appear as statistically significant because of the large standard error (or confidence interval) associated with the estimate for the Northern Territory.

Table ES3: Percentages of Students Attaining the Proficient Standard in ICT Literacy by Jurisdiction for Year 6 and Year 10 in 2008

	Year 6			Year 10		
	2008 cycle		Increase (2005 - 2008)	2008 cycle		Increase (2005 - 2008)
	Percentage	Confidence Interval		Percentage	Confidence Interval	
New South Wales	54.6	±5.7	No	66.9	±5.4	No
Victoria	**66.1**	±6.5	No	69.8	±6.7	No
Queensland	48.2	±5.3	Yes	61.9	±6.2	No
South Australia	64.4	±5.3	Yes	64.6	±4.9	No
Western Australia	50.7	±4.1	Yes	65.3	±5.9	Yes
Tasmania	51.6	±7.0	No	57.8	±7.4	No
Northern Territory	**42.2**	±10.6	No	**45.8**	±13.4	No
Australian Capital Territory	**75.1**	±6.6	Yes	**77.1**	±6.1	No
ALL	**56.7**	**±2.8**	**Yes**	**66.0**	**±3.0**	**No**

Notes: Increase (2005 to 2008) refers to a change between cycles that was statistically significant. Percentages that are shown in bold are statistically significantly different from the national percentage.

Table ES3 shows the percentages attaining the proficient standards for Year 6 and Year 10 in each jurisdiction in 2008 with a note designating whether the change between 2005 and 2008 was statistically significant.

Differences associated with student characteristics

Student background characteristics were related to ICT literacy and the patterns are similar in Year 6 and Year 10. The largest effects are associated with socioeconomic background. In Year 6, 41 per cent of students whose parents are from the "unskilled manual, office and sales occupational groups attain the proficient standard compared to 72 per cent of students whose parents are from the "senior managers and professionals" occupational group. In Year 10 the corresponding figures are 52 per cent and 78 per cent. These differences

are similar to the differences reported in 2005 and they are partly, but not entirely, associated with differences students experience and frequency of using computers.

There is a substantial gap in the ICT literacy of Indigenous and non-Indigenous students. In Year 6, 24 per cent of Indigenous students attained the proficient standard compared to 59 per cent of non-Indigenous students. At Year 10, the corresponding percentages were 32 per cent and 68 per cent. The gap in ICT literacy achievement between Indigenous and non-Indigenous students is greater in 2008 than it was in 2005.

There was also evidence of differences in ICT literacy among geographic locations. At both Year 6 and Year 10 the tendency was for metropolitan students to record higher ICT literacy scores than students in provincial areas who, in turn recorded higher scores than those in remote areas. Among Year 6 students, the difference between metropolitan and provincial students was statistically significant as was the difference between metropolitan and remote students. The percentages of Year 6 students attaining the proficient standard were 61, 48 and 38 per cent for metropolitan, provincial and remote respectively. Among Year 10 students the differences in means between metropolitan and provincial, metropolitan and remote students, and the difference between provincial and remote students, were all statistically significant. The percentages of Year 10 students attaining the proficient standard for metropolitan, provincial and remote locations were 69, 62 and 45 per cent. The differences between percentages attained for each geographic location are very similar to those reported from the 2005 survey.

Females recorded higher levels of ICT literacy than males and this is consistent with the tendency observed in 2005. There were no differences at all between students for whom a language other than English was mainly spoken at home and other students.

Computer Use at Home and School

Over the period from 2005 there was an increase in the use of computers at home and at school. In 2008 54 per cent of Year 6 students and 73 per cent of Year 10 students used a computer at home almost every day or more frequently. In 2005 the corresponding figures were 43 per cent and 58 per cent (MCEETYA, 2007: 64). There was also an increase in school computer usage almost every day or more frequently. In Year 6 the increase in “daily” use between 2005 and 2008 was from 14 to 21 per cent and in Year 10 the increase was from 18 to 32 per cent. This increase in computer usage may well be the reason for the increased level of ICT literacy although there may have also been a change in the ways in which students are taught to use computers.

Social communication is the group of most frequently used applications followed by entertainment and school utilities with computer technology being the least frequently used group of applications. Within social communication the most frequently used applications were email or "chatting" and searching the Internet for information that is not for study or school work. Nearly 30 per cent of students used email or chat at least once per day and 22 per cent searched the internet for non-study information at least once per day. In the group of entertainment applications the most frequently used were using a computer to listen to music or watch DVDs and playing games on a computer. There were 24 and 18 per cent of students who did this at least once each day. In the group of school utilities the most frequently used applications were searching the Internet for information for study or school work and using word processing software to write documents. These applications were used at least once each day by 11 and 9 per cent of students respectively.

In Year 6 and Year 10 female students use computers for social communication more frequently and for entertainment less frequently, than do males. In Year 6, but not in Year 10, females use school utility applications more frequently than males (in Year 10 there is no difference). In Year 10, but not in Year 6, females use computer technology applications less frequently than males. Overall students in Year 10 use computers much more frequently for social communication, somewhat more frequently for entertainment and just a little more frequently for school utilities.

The analysis of the 2008 survey indicated that home computer usage (and experience in using computers) was associated with higher ICT literacy scores in Year 6 and Year 10. However, it was the use of school utilities that was positively associated with ICT literacy. Use for social communication in Year 10 and technology applications in Year 6 had net negative associations with ICT literacy and entertainment use had no association with ICT literacy at all. In addition there was an association between interest in computers and ICT literacy. Students who were favourably disposed to working with computers attained higher levels of ICT literacy.

Conclusion

Over the period from 2005 to 2008 there have been some important changes in the context for the assessment of ICT literacy. One of these is that there has been continued growth in the extent to which young people have access to and use ICT (and web-based technology in particular) at home and at school. Australian teenagers continue to have access to, and use, ICT to a greater extent than their peers in many other countries and are among the highest users of ICT in the OECD (Anderson & Ainley, 2009). Another is the quickening interest in the ways in which young people are prepared for contemporary life. This interest is evident in the inclusion of "digital competence" in the European competencies for lifelong learning (European Commission, 2006), the

implementation of the "digital education revolution" as a feature of education policy in the national reform agenda in Australia and discussions about the nature of concepts such as "information literacy" in a technological age (Catts and Lau, 2008).

In general the results from the 2008 assessment of ICT literacy indicate that Australian students are well prepared for these aspects of contemporary life. Overall, 57 per cent of Year 6 students attained the proficient standard for that Year level by being able to: "generate simple general search questions and select the best information source to meet a specific purpose, retrieve information from given electronic sources to answer specific, concrete questions, assemble information in a provided simple linear order to create information products, use conventionally recognised software commands to edit and reformat information products". Sixty-six per cent of Year 10 students reached or exceeded the proficient standard for Year 10 by indicating that they were able to: "generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose, create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose". Moreover, from 2005 to 2008 there was a definite improvement in the ICT literacy of Year 6 students and a less certain improvement in ICT literacy across Year 10 students. However, there remains variation among students in ICT literacy. Many students use ICT in a relatively limited way and this is reflected in their overall level of ICT literacy. There are also significant differences associated with socioeconomic background, Indigenous status and remote geographic locations that need to be addressed in the next few years.

Chapter 1
Introduction

In 2005 Australia conducted a national sample assessment of ICT literacy (NAP-ICTL05) among students in Year 6 and Year 10. This assessment was computer-based and it seamlessly combined tasks requiring the performance of specific functions within software simulations with the creation of products using live applications in a rotated set of thematic modules. The inclusion of "large" tasks that were completed using multiple functions within live software broke new ground. When completing these large tasks, students typically needed to select, assimilate and synthesise the information they had been working with in the lead-up tasks and reframe the information to fulfil a specified communicative purpose. Previously, assessment methods that provided for analysing higher-level abilities (such as rubric-scored portfolios) had proven to be very difficult to scale above the classroom level. This current report is about the second cycle of national assessments of ICT Literacy (NAP-ICTL08) which extended this approach of performance assessment to a second cycle and embraced some new developments.

Context

Since NAP-ICTL05 there have been several important developments in the context for the national assessment of ICT Literacy. The first is that there has been continued growth in the extent to which young people have access to and use ICT (and web-based technology in particular) at home and at school. Australian teenagers continue to have access to, and use, ICT to a greater

extent than their peers in many other countries and are among the highest users of ICT in the OECD (Anderson & Ainley, 2009). It has also become evident that Australian teachers (at least teachers of mathematics and science in lower secondary school) are among the highest users of ICT in teaching (Ainley, Eveleigh & O'Malley, 2009).

A second development has been the re-iteration of the importance of ICT in education in the *Melbourne Declaration on Educational Goals for Young Australians* which was released in December 2008 (MCEECDYA, 2008). The Melbourne Declaration asserted that "in this digital age young people need to be highly skilled in the use of ICT". This represents a continuation of a theme from the earlier Adelaide Declaration of *Australia's National Goals for Schooling* which stated that when students left school they should be: "confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society" (MCEETYA, 1999). Of course the Adelaide Declaration was still operative at the time of the development and implementation of NAP-ICTL08.

A third development has been an increased international focus on changes in the ways in which young people are prepared for contemporary life. This new focus includes concepts such as "information literacy" (Catts and Lau, 2008), "digital competence" (European Commission, 2006); and the "creative use of ICT" (Kelly & Haber, 2006). Since NAP-ICTL08 an international project emerged on the *Assessment and Teaching of 21st Century Skills* (McGaw, 2009). Although this development became public after NAP-ICTL08 it is a manifestation of a developing interest in defining appropriate competencies for the emerging age and exploring how information technologies could facilitate the assessment of those competencies. Two of the competencies being explored in that project are *Information Fluency* and *Technological Literacy*. These are notions that overlap with the concept of ICT Literacy.

A fourth development has been implementation of the "digital education revolution" as a feature of education policy in the national reform agenda. This national initiative involves significant support for improving ICT provision in schools, expanding the use of ICT in teaching and learning and developing the ICT proficiency of young Australians. It includes the provision of computers for all secondary schools with students in Years 9 to 12, supporting the deployment of fibre-to-the-premises broadband connections to Australian schools and professional development for teachers in the pedagogical use of ICT.

What is ICT Literacy

NAP-ICTL05 was based on a definition of ICT Literacy adopted by MCEETYA. ICT literacy was defined as:

> *the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society (MCEETYA, 2005).*

That definition was elaborated first through a set of six key processes, then three broad strands and then in the form of a progress map that articulated what was meant by progress in ICT Literacy (MCEETYA, 2007).

Since that first national assessment of ICT literacy there have been several important publications concerned with conceptualising the capabilities involved in the use of ICT. ICT literacy is increasingly regarded as a broad set of generalisable and transferable knowledge, skills and understandings that are used to manage and communicate the cross-disciplinary commodity that is information. The integration of information and process is seen to transcend the application of ICT within any single learning discipline (Markauskaite, 2007; Amtmann & Poindexter, 2008).

Common to information literacy are the processes of identifying information needs, searching for and locating information and evaluating the quality of information (Catts and Lau 2008). Most views of information literacy extend these processes to include ways in which collected information can be transformed and used to communicate ideas. ICT literacy has not focused on programming but on the declarative and procedural knowledge about computer use (computers being seen as an important sub-domain of ICT). More recent writing about information literacy has adopted and largely subsumed computer (or ICT) literacy now that digital technologies have developed as the world's primary information management resources. According to Catts and Lau (2008) "people can be information literate in the absence of ICT, but the volume and variable quality of digital information, and its role in knowledge societies, has highlighted the need for all people to achieve information literacy skills".

The National Assessment of ICT literacy

The core of NAP-ICTL08 was an assessment of student ICT Literacy that was computer-based and included tasks using simulated ICT screens as well as authentic applications of real software to larger tasks. The assessment was structured to be congruent with the 2005 assessment of ICT Literacy and thereby provide a basis for comparison. The assessment tool, and the tasks incorporated in that tool, embodied as much authenticity as possible. In addition NAP-ICTL08 includes a computer-based survey of students' familiarity

with, access to and use of ICT, and some detail about their use of various computer applications. NAP-ICTL08 made the maximum possible use of school computing resources.

Structure of the Report

Following this brief introduction the report proceeds to Chapter 2 which outlines the way in which ICT Literacy was assessed. This describes the framework, the assessment instrument, the method of delivering the assessment and the sample that was surveyed. Chapter 3 presents a national profile of ICT Literacy. It discusses the ICT Literacy scale and equating of NAP-ICTL08 with NAP-ICTL05 as well as measures of ICT Literacy for Year 6 and Year 10 in 2005 and 2008. Chapter 4 describes patterns of ICT Literacy among States and Territories and in relation to sex, socioeconomic background, Indigenous status, language background and geographic location. Chapter 5 is concerned with student familiarity with, access to and use of ICT at home and at school. It includes a detailed analysis of the applications most frequently used by students and student interest in computers. Chapter 6 provides an overview of the findings and a discussion of the implications of those findings.

Chapter 2
Assessing ICT Literacy

The assessment used in the 2008 assessment of ICT Literacy (NAP-ICTL08) was based on the same assessment framework that had been articulated in the 2005 assessment (NAP-ICTL05). As was the case in 2005 the assessment instrument was computer-based and included simulated ICT screens that behaved in the same way as common application programs and authentic applications of real software to larger tasks so as to produce work for subsequent assessment. The assessment as a whole was structured to be congruent with the 2005 assessment of ICT Literacy and thereby provide a basis for comparison with that assessment. In this chapter some key features of the 2008 assessment are outlined. The assessment domain that framed the ICT literacy assessment is briefly outlined but without repeating the detail that was elaborated in the report of the 2005 assessment (MCEETYA, 2007). The assessment tool, and the tasks incorporated in that tool are described with an emphasis on the new tasks and how all the tasks embodied as much authenticity as possible. In addition the chapter describes how the assessment was delivered to make maximum possible use of school computing resources. Finally, the chapter describes the designed and achieved sample.

Assessment Domain

Definition

Prior to the 2005 national assessment the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) defined ICT as *technologies*

used for accessing, gathering, manipulation and presentation or communication of information and adopted a definition of ICT Literacy as:

> *the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society (MCEETYA, 2005).*

This definition, which draws heavily on the Framework for ICT Literacy developed by the International ICT Literacy Panel in 2003 and the OECD PISA ICT Literacy Feasibility Study (International ICT Literacy Panel, 2002), was the basis for the 2005 assessment and remained the basis for the 2008 assessment. In addition, while ICT could be broadly defined to include a range of tools and systems, these assessments focused primarily on the use of computers rather than other forms of ICT.

Framework

The 2005 assessment framework envisaged ICT literacy as comprising a set of six key processes:

1. accessing information (identifying information requirements and knowing how to find and retrieve information);
2. managing information (organising and storing information for retrieval and reuse);
3. evaluating (reflecting on the processes used to design and construct ICT solutions and judgements regarding the integrity, relevance and usefulness of information);
4. developing new understandings (creating information and knowledge by synthesising, adapting, applying, designing, inventing or authoring);
5. communicating (exchanging information by sharing knowledge and creating information products to suit the audience, the context and the medium); and
6. using ICT appropriately (critical, reflective and strategic ICT decisions and considering social, legal and ethical issues).

Conceptions of progress

Any assessment is underpinned by a conception of progress in the area being assessed. This assessment of ICT literacy was based on a hierarchy of what students typically know and can do. It was articulated in a progress map described in terms of levels of increasing complexity and sophistication in using ICT. For convenience, students' skills and understandings are described in bands of proficiency. Each band describes skills and understandings that are progressively more demanding. The progress map is a generalised developmental sequence that enables information on the full range of student performance to be collected and reported. Student achievement of the different

ICT Literacy processes can only be demonstrated by taking into account the communicative context, purpose and consequences of the medium. As such, the ICT Literacy progress map was based on three "strands": A) working with information; B) creating and sharing information; and C) using ICT responsibly.

- In *Working with Information*, students progress from using key words to retrieve information from a specified source, through identifying search question terms and suitable sources, to using a range of specialised sourcing tools and seeking confirmation of the credibility of information from external sources.
- In *Creating and Sharing Information*, students progress from using functions within software to edit, format, adapt and generate work for a specific purpose, through integrating and interpreting information from multiple sources with the selection and combination of software and tools, to using specialised tools to control, expand and author information, producing representations of complex phenomena.
- In *Using ICT Responsibly*, students progress from understanding and using basic terminology and uses of ICT in everyday life, through recognising responsible use of ICT in particular contexts, to understanding the impact and influence of ICT over time and the social, economic and ethical issues associated with its use.

In each of the strands there were six proficiency levels hypothesised. These were not proposed as discrete steps that are discontinuous but are proposed as a means of representing progress within each strand. The proficiency levels in each strand are shown in Table 2.1. Examples of specific manifestations of these proficiencies in terms of skills are tabulated in Appendix 2 and detailed descriptions of the assessment tasks were provided in the report of the 2005 assessment (MCEETYA, 2007: 33-43). Actual items are available in the released materials from the 2005 assessment (MCEETYA, 2008).

Statements of Learning for ICT

The assessment framework for 2008 needed to be consistent with that used as the basis for the 2005 assessment. However, the 2008 assessment took account of the Statements of Learning for Information and Communication Technologies developed through the *Australian Education Systems Official Committee* (AESOC) on behalf of MCEETYA (AESOC, 2006). The Statements of Learning describe the "knowledge, skills, understandings and capacities" in the field of ICT that all students in Australia should have "the opportunity to learn". Clearly there is an overlap with the concept of ICT Literacy. The Statements of Learning characterise ICT learning in terms of five overlapping elements. These five elements are:

1. *Inquiring with ICT.* This involves the use of ICT to identify information needs and to locate, access and retrieve information and data. It includes

organising, manipulating and structuring information to improve interpretations and construct new understandings.

2. *Creating with ICT.* This involves the creation of information products that demonstrate understanding and creativity and support thinking processes. It involves analysing problems, exploring ideas, selecting appropriate ICT functions, developing concepts and evaluating solutions.
3. *Communicating with ICT.* Students use ICT to enhance communication. They share, interact, develop relationships and apply ICT to present information and data, engage with audiences and collaborate in meaningful ways. They use ICT to communicate with individuals, local and global communities.
4. *Ethics, issues and ICT.* Students understand the role of ICT in society and its impact on people and work. They have an appreciation of the roles and responsibilities of people working with ICT and are discriminating, ethical, legal, responsible and safe users of ICT. They reflect on past ICT issues and are able to explore the impact of ICT developments
5. *Operating ICT.* Students efficiently operate a range of ICT functions and applications for creating, communicating, inquiring and for the management, storage and retrieval of information and data. They competently perform operational sequences and use features of the ICT to achieve intended outcomes. They apply preventative strategies for maintaining ICT and solve basic ICT-related problems as end-users.

There is an evident correspondence of four of these five elements with the six key processes in the 2005 framework.

- "Inquiring with ICT" aligns with a combination of "accessing information" (1) and "managing information" (2);
- "Creating with ICT" aligns with "developing new understandings" (4);
- "Communicating with ICT" aligns with "communicating" (5); and
- "Ethics issues and ICT" aligns with "using ICT appropriately" (6).

"Operating ICT" in the Statements of Learning does not have an explicit parallel in the key processes in the MCEECDYA framework. This is partly because functions and applications were embedded in the processes of the MCEECDYA framework and partly because maintenance and problem solving is a new emphasis not mentioned in the framework.

The elements of the Statements of Learning contribute to the three strands of the ICT Literacy Progress Map (*working with information; creating and sharing information; and using ICT responsibly*) shown in Table 2.1 in a similar way to the six key processes.

In summary, the elements of ICT learning specified in the Statements of Learning were consistent with the progress map for ICT literacy but pointed to ways in which some underlying competencies might be elaborated differently in tasks. Therefore they informed the task development rather than changed the underlying progress map.

Table 2.1: Information and Communication Technology Literacy Progress Map

ICT literacy is the ability of individuals to use ICT appropriately to access, manage and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society.

Proficiency level	**Strand A: Working with Information** *This strand includes* identifying the information needed; formulating and executing a strategy to find information; making judgements about the integrity of the source and content of the information; and organising and storing information for retrieval and reuse.	**Strand B: Creating and Sharing information** *This strand includes:* adapting and authoring information; making choices about the nature of the information product; reframing and expanding existing information to develop new understandings; and collaborating and communicating with others.	**Strand C: Using ICT responsibly** *This strand includes:* understanding the capacity of ICT to impact on individuals and society, and the consequent responsibility to use and communicate information legally and ethically.
6	Uses a range of specialised sourcing tools. Seeks confirmation of the integrity of information from credible, external sources. Uses tools, procedures and protocols to secure and retrieve information.	Uses specialised tools to control, expand and author information. Produces complex products. Critiques work and applies knowledge of conventions that shape interpretations when communicating across a range of environments and contexts.	Understands the impact and influence of ICT over time, recognising the benefits, constraints and influence of social, legal, economic and ethical issues on participation in society.
5	Searches for and reviews the information needed, redefining the search to limit or expand. Judges the quality of information for credibility, accuracy, reliability and comprehensiveness. Uses appropriate file formats and procedures to store, protect, retrieve and exchange information.	Uses tools to interrogate, reframe and adapt information. Uses a range of tools to create and enhance the design, style and meaning of information products to suit the purpose and audience.	Understands the social, legal, economic and ethical consequences associated with using ICT across a range of environments and contexts.
4	Develops questions or keyword combinations and selects appropriate tools to locate information. Appraises located information for relevance, currency and usefulness. Uses tools to structure, group and reorganise information for retrieval.	Integrates and interprets information from multiple sources. Selects and combines software and tools to structure, link and present work. Communicates work for different purposes, environments and contexts.	Understands the need for laws, codes of conduct and procedures for ICT use in different contexts. Recognises the potential for misuse of ICT and that there are procedures to address this.
3	Identifies a search question, terms and suitable sources. Browses and retrieves information. Compares and contrasts information from similar sources. Organises and arranges relevant information and files.	Reorganises information from similar sources, using the main ideas. Selects software and tools to combine and transform text, images and other elements. Communicates work using different representations for particular contexts.	Recognises fair use, software restrictions and legal requirements. Identifies responsible use of ICT in particular contexts.
2	Identifies and uses keywords in a search to locate and retrieve information from various sources. Identifies and records relevant content.	Uses the functions within software to edit, format, adapt and generate work to achieve a specific purpose and when communicating with others.	Identifies codes of conduct and ergonomic practices for ICT. Understands ICT terminology and use of computers in society.
1	Uses keywords provided to retrieve information from a single, specified source. Recognises information required. Opens software and saves files.	Identifies and uses some of the basic symbols and functions of software to record ideas.	Understands and uses basic terminology and general procedures for ICT. Describes uses of ICT in everyday life.

Other developments that influenced assessment content

More than ten years ago the emergence of the world-wide-web as a way of providing access to a wider range, and a richer array of resources became seen as an important development for education. It also facilitated communication among individuals typically through emails and list servers. Recent times have seen the steady emergence of more interactive ways of using web (Greenhow, Robelia & Hughes, 2009). These have sometimes been characterised as Web 2.0 (a term that emerged in 2004) technologies but others have argued that they are better described as a continuous development of more interactive features in the Web (Leu, O'Byrne et al, 2009). Whether these features are seen as a continuous evolution, or as a discontinuous change, the important ramification is that there has been a change in the ways in which communication takes place and people interact with resources. Hence the need to include web based components in the assessment tasks.

A second development concerns the availability of suites of application software. In the 2005 cycle it was necessary to use the Microsoft Office suite of applications because of the availability of simulated applications from which student response data could be captured. Since then it has been possible to devise ways in which more generic open-source software (Open Office) could be used for this assessment and either capturing responses to single tasks or capturing the products of larger multi-task projects. Using Open Office was intended to facilitate the release of school materials from the project. The new modules in the 2008 assessment made use of Open Office software except for the operating system which had the same look and feel as the Microsoft Windows family of operating systems.

Two software application types that were considered, but subsequently not included in the 2008 instrument were: graphic organising (such as mind-mapping) software; and film or multimedia editing software. Graphic organising software was not included primarily because of the concern that it would not be an efficient use of the available assessment time. Although this type of software was used by some teachers (especially in primary schools) the products students produce typically provide little useful assessment information of the type needed in national assessment. Multi-media software was not included primarily for technical reasons. Most multi-media software uses substantial processing resources (memory on PCs and band-width if the media are being 'streamed'). Given the nature of the testing that we were undertaking (with large numbers of simultaneous users working remotely on a common set of servers), having students complete anything other than very simple editing of animations (such as Flash) could have compromised the functioning of the whole testing system.

Assessment Instrument

Design

The national assessment of ICT Literacy in 2008 (NAP-ICTL08) followed the practice of other national assessments by including some tasks (modules) that were identical to those used in 2005 so as to evaluate the extent of change as well as new tasks (modules). The assessment instrument consisted of seven discrete modules. Six of the seven modules included large tasks to be completed. All students completed the GST and one other 2005 module. They were then randomly assigned two year-level appropriate 2008 modules.

The nature of these modules, and the large tasks involved in them, is summarised in Table 2.2.

The ICT assessment instrument was designed to mirror students' typical 'real world' use of ICT. Students completed all tasks on computer using a seamless combination of simulated and live software applications. The assessment items were grouped in thematically linked modules each of which followed a linear narrative sequence. The narrative sequence in each module typically involved students collecting and appraising information before synthesising and reframing the information to suit a particular communicative purpose and given software genre. The overarching narratives across the modules covered a range of school-based and out-of-school based themes.

A basis for assessing changes since 2005

Three of the modules had been used in the 2005 ICTL assessment. One of these modules, the General Skills Test, included only simulation and multiple-choice assessment items. The other two were Photo Album and DVD day which incorporated conventional simulation, multiple-choice and constructed response items with live application software. Photo Album involved students using software that they would not have encountered previously and DVD day involved the use of a generic web browser and applications from Microsoft Office.

Table 2.2: Assessment Modules and Large Tasks

Module	Module description and large tasks
2005 Trend Tasks	
General Skills Test	No large task but a series of items built around typical computing skills with several items involving the theme of crocodiles
Photo Album	Students use unseen photo album software to create a photo album to convince their cousin to come on holiday with them.
DVD Day	Students navigate a closed web environment to find information and complete a report template.
2008 Tasks	
Friends PC	Students install photo-management software on a new PC; change the settings for antivirus software; organise a photo collection; and edit a photo.
School Survey	Students up-date an electronic survey about after-school activities in their school intranet and write a brief report that describes the data obtained from the survey.
Sports Picnic	Students plan a school sports picnic using a sports Blog web-site to find a suitable venue, a comparative search-engine to search for a suitably priced soccer ball and graphics software to construct invitations.
Internet Use	Students search for and evaluate information about restricting internet access, take notes and create a presentation addressing the question of whether a youth centre should provide unrestricted internet access.

Extending the assessment with new modules

Four of the modules were new for the 2008 assessment survey. These new modules place greater emphasis on expressions of conceptual understanding of ICT and the completion of the large tasks because the assessment of more basic skill tasks was covered in the modules that had been carried forward from 2005. ICT education experts commented that in the 2005 assessment students were given limited time to plan their large information products. In assessment terms, evidence of students' achievement in planning tasks was inferred from the quality of their tasks rather than being specifically targeted in the assessment. One module in the 2008 assessment consisted almost exclusively of research, planning and production of an information product. The 2005 instrument provided little information about the shape of higher level achievement of students in Strand C of the ICT literacy progress map that framed the project. More of this information was collected in the 2008 modules both through targeted short answer questions and by adopting an aspect of appropriate ICT use as the focus topic of one of the new modules.

The new modules were as follows.

- *Internet Use* (Year 10 only). Students were required to search for and evaluate information regarding the relative merits of restricting internet website access to young people. In addition to this, the students answered some questions and completed skills tasks regarding internet security and communications. The students were then required to select the information and take 'notes' from a set of electronic resources. Following this, the students then used all the resources, including their notes to create a

presentation addressing the question of whether a particular youth centre should provide unrestricted internet access.

- *School Picnic* (Years 6 and 10). Students were informed at the beginning of this module that they will be helping to plan a school sports picnic for students, teachers and parents. The students first use a sports Blog web-site to find a venue that suits their requirements for the picnic. The students then used a comparative search-engine to search for a suitably priced soccer ball to be used in the matches. Finally the students use a piece of tailored graphics software to put together invitations for parents to the picnic. The software for this final task included a piece of mapping (navigation) software that students used to create a map with directions to the picnic venue that they included as part of the invitation.
- *School Survey* (Years 6 and 10). Students were asked to up-date an electronic survey regarding its after-school activities program on their school intranet and then write a brief report to their teacher that describes the data obtained from the survey. The students were first provided with the text of a small number of questions after which they were required to use a web-based survey application to make revisions. Subsequently, the students were provided with a set of 'data' from the survey results in a spreadsheet in order to produce graphs. The students were then provided with a full set of data (including graphs) in a spreadsheet and a small set of headings in a document as the skeleton of their report on the survey results. The students were then required to use the data and their own connecting text to complete the report.
- *Friends PC* (Years 6 and 10). Students were told at the beginning of this module that a friend has a new PC and they have been asked to help to install photo management software; change the settings for the antivirus software; organise the friend's photo collection; and edit a photo. The students complete a series of website navigation tasks and answer questions dealing with downloading software. The questions deal primarily with issues such as software registration, virus software configuration and software license agreements. The students then complete some file management tasks based around installing the new software before finally using some simple photo editing software to clean up (e.g. remove red-eyes, remove blur, crop) an image.

Assessment system

The software developed by SoNET systems contained all the assessment modules and a management system that confirmed the identity of the selected student, asked basic registration information, assigned each student to the modules appropriate to their Year level (this was random within each Year level) and collected student responses to the survey questions. As was the case in the 2005 assessment the on-screen environment of the assessment instrument had three main sections: a surrounding border of test-taking information and navigation facilities; a central information section that could house stimulus

materials for students to read or (simulated or live) software applications; and a lower section containing the instructional and interrogative text of the assessment items and the response areas for multiple-choice and constructed response items. The assessment items were presented in a linear sequence to students. Students were not permitted to return to previously completed items as, in some cases, later items in a sequence provide clues or even answers to earlier items.

The assessment system consisted of a sequence that included two sets of rotations. The total time for administration of the instrument was less than two hours (of which 100 minutes was the assessment and questionnaire and 15 minutes was for introduction and tutorial). The sequence was as follows.

- All students completed registration and a tutorial to familiarise them with the assessment system (15 minutes).
- All students completed the general skills test (15 minutes).
- Students completed one of the two trend modules as randomly assigned (25 minutes).
- Students completed two year-level appropriate new modules (one of the new modules was for Year 10 only) as randomly assigned (25 minutes each).
- All students completed the student questionnaire (15 minutes).

Student Questionnaire

As was the case for the 2005 ICT Literacy assessment there was a questionnaire for students incorporated in the survey instrument. This had two parts. The first part was concerned with student's access to, familiarity with, use of and interest in using computers. The second part was concerned with student's demographic characteristics as specified for national assessment surveys.

The purposes of the first part of the student questionnaire were to provide descriptive information about students and ICT in schools and outside of schools and to provide an insight into some of the important factors that influence students' ICT literacy proficiency. The questionnaire was similar to that used in 2005 (so as to provide the basis for comparisons between the two cycles) but with some new items. The student questionnaire for NAP-ICTL08 consisted of three groups of items:

- Student familiarity with computers (experience of computer use and the frequency of using computers at home, school and other places).
- Student use of computer applications (how frequently students use each of 20 different types of applications). The applications were structured around four types of application: communication, school utilities, computer technology and entertainment.

- Student interest in using computers (based on a set of seven statements about computer use).

The changes from 2005 to 2008 were to increase the number of possible response categories about frequency of use so as to capture more frequent use (by introducing the category "at least once every day" in addition to "almost every day"), to increase the range of computer applications listed (and capture applications that had emerged since 2005) and to increase to seven the number of items on which the measure of interest was based. All the changes were made in a way that preserved compatibility with the 2005 data.

Delivery Methods

Delivery of NAP-ICTL05 took account of the computer resources in schools (in relation to numbers, co-location and capacity), the storage requirements for the assessment software (could not be stored on a CD) and the limitations of the bandwidth for school connections to the internet. For this reason the solution adopted was to deliver sets of laptop computers (mini-labs) to each school and have the assessment administered by a trained administrator.

For NAP-ICTL08 the preferred medium of delivery of the assessment was to use school-based computers. This was possible because of developments in the technology available for delivery that had not been available in 2005 and because of the enhanced provision of school computer resources between 2005 and 2008[2]. In delivering the assessment to schools three options were provided.

Internet access to a remote server

This delivery method required a sufficient number of co-located networked computers (a minimum of 10) with access to an internet gateway that had sufficient capacity for 10 students to interact with the material remotely without being compromised by other school internet activity. When schools were contacted they provided information about bandwidth (the field trial indicated a bandwidth of 4mbps would be needed) and completed an on-line test form using at least two computers to be used for the assessment to ensure that they could connect at an appropriate speed. A packaging system (Juniper) was installed on the server to facilitate transmission of data. In principle this would have been the preferred delivery method because the assessment software operates on a remote host server and makes few demands on the resources of the school computers. Since the operation took place on the server it provided a uniform assessment experience and ensured that student responses were collected on the host server.

2 The development of the delivery system to schools was led by SoNET systems and was informed by the results of a series of pilot studies and the field trial. We explored the use of a Remote Desktop Protocol (RDP) connection to the remote server but that was often not possible because of security provisions in school networks and the use of the Next G wireless network was too expensive to implement.

Connection of a local server to a school network

This delivery method required a sufficient number of co-located networked computers but did not require a connection to the internet. The method required one laptop computer of moderate capacity, with all the assessment resources loaded on it, to be brought to the school by the test administrator. The laptop was connected to the school network and a batch file was run so that it would function as a local server on the school network. After the assessments were connected the student response files were delivered to ACER using an internet connection (including the "Next G" wireless network) as well as being backed up on USB drives that were delivered by conventional means to the central administration.

Provision of a mini-lab of computers

For schools with insufficient co-located and networked computers the project provided a set of nine student notebooks and a higher specification notebook to act as the server for those machines. This set of equipment is called a mini-lab. The assessment software was located on the "server" laptop and student responses were transmitted to the central server in the same way as for the local server to school network delivery mode.

Use of delivery methods

An important feature of all three delivery methods was that the experience of the student with the assessment was identical. There were differences between states and territories, and between primary and secondary schools, in the frequency with which different delivery methods were used. Data about the frequency of use of the alternative methods are shown in Table 2.3.

The data in Table 2.3 indicate that the method involving the connecting of a local server was the most commonly used method being adopted in 68 per cent of schools. Use of an internet connection to a remote server was adopted in 18 per cent of the schools and the mini-lab method was adopted in 14 per cent of the schools.

Table 2.3: Percentages of Schools Utilising Each Available Delivery Method for ICT Literacy Assessment

	Year 6			Year 10			All		
	Remote Server	Local Server	Mini Lab	Remote Server	Local Server	Mini Lab	Remote Server	Local Server	Mini Lab
New South Wales	9	65	26	25	71	4	17	68	15
Victoria	34	47	19	34	53	13	34	50	16
Queensland	8	82	10	8	85	6	8	84	8
South Australia	9	76	16	7	89	4	8	82	10
Western Australia	24	61	15	42	47	11	33	54	13
Tasmania	20	47	33	20	67	13	20	57	23
Northern Territory	5	74	21	7	79	14	6	76	18
Australian Capital Territory	0	72	28	11	78	11	3	77	20
Total Sample	**15**	**65**	**20**	**21**	**70**	**9**	**18**	**68**	**14**

Note: Row percentages are shown for each group

The delivery method involving an internet connection to a remote server was adopted by one-third of the schools in Victoria and Western Australia and one fifth of the schools in Tasmania and New South Wales. In the other states and territories it was rarely used. This method was a little more frequently used in secondary schools than primary schools. The mini-lab method was used twice as frequently in primary (20 per cent of primary schools) as in secondary schools (nine per cent of secondary schools).

Sample

The samples were designed and implemented so that estimates representative of the Year 6 and Year 10 populations in Australia, as well as for States and Territories and designated sub-groups, could be generated.

Sample design

The sampling procedure followed the cluster sampling procedures established for national sample surveys conducted by the *Performance Measurement and Reporting Taskforce* (Murphy & Schulz, 2006). Cluster sampling is cost-effective because a group of students from the same school can be surveyed at the same time, rather than possibly just one or two students if a simple random sample of students from the population were to be drawn. Sampling involves a two-stage process to ensure that each eligible student has an equal chance of being selected in the sample. Compared to the NAP-ICTL survey conducted in 2005 the sample size in 2008 was increased in two ways so as to provide a higher level of precision (i.e. smaller confidence intervals):

- The designed number of sample schools was increased from approximately 500 schools to approximately 600; and
- The number of students sampled in each school was increased from 15 to 20 students.

Sampling process

In the first stage of sampling schools were selected from a list of all schools in each State or Territory with a probability proportional to the number of students in the relevant Year level enrolled at that school. The list of schools was explicitly stratified by location and sector and implicitly listed in postcode order to ensure that the sample was representative. A small number of schools were excluded from the selection process. The number of schools from each of the mainland States was similar so as to ensure a similar level of precision in the estimates derived from those samples. The percentage of schools selected from within Tasmania, the Northern Territory and the Australian Capital Territory was greater than would have been expected on a proportionate basis so as to improve the precision of the estimates for those jurisdictions.

In the second stage, 20 students were selected at random from a school-provided list of all eligible students from the Year level. At the same time a list of eight replacement students was selected in case one or more of the students was ineligible to participate [3] or was absent on the day of testing. By selecting students at random from the Year level, and by selecting only 20 students per school, the sample had enhanced precision over a sample of the same number of students based on selecting intact classes because the effects of students being in classes similar to each other was reduced.

Achieved sample

The total achieved sample for the survey consisted of 10,926 students of which 5,604 were from Year 6 and 5,322 were from Year 10. The use of mini labs at some schools only allowed 18 students to be tested in those schools and because many small schools had fewer than 20 students the number of students assessed per school averaged 18.7 for Year 6 and 18.2 for Year 10. Table 2.4 records the distribution of the achieved sample across the States and Territories for each Year level. Details of the social and demographic characteristics of students in the sample are recorded in Appendix 1.

Table 2.4: Numbers of Students and Schools in the Achieved Sample

	Year 6		Year 10	
	Schools	Students	Schools	Students
New South Wales	46	842	48	895
Victoria	47	898	47	850
Queensland	49	949	48	884
South Australia	45	865	45	836
Western Australia	46	849	43	805
Tasmania	30	533	30	545
Northern Territory	18	326	13	189
Australian Capital Territory	18	342	18	318
Total Sample	**299**	**5,604**	**292**	**5,322**

Calculating the precision of estimates

For any survey there is a level of uncertainty regarding the extent to which an estimate measured from the sample of students is the same as the true value of the parameter for the population. An estimate derived from a sample is subject to uncertainty because the sample may not reflect the population precisely. If a statistic was estimated from different samples drawn from the same population of students the observed values for the statistic would vary from sample to sample. The extent to which this variation exists is expressed as the confidence interval. The 95 per cent confidence interval is the range within which the

3 Within the sampled classrooms, individual students were eligible to be exempted from the assessment on the basis of functional disability, intellectual disability or limited assessment language proficiency.

estimate of the statistic based on repeated sampling would be expected to fall for 95 of 100 samples drawn. The survey sample design in this study involves clustering, stratification, and disproportionate allocation which mean that it is not appropriate to use the estimates of confidence intervals through standard software procedures because these generally assume a simple random sample and will therefore underestimate the real confidence intervals. The estimates of confidence intervals in this report are based on 'Jacknife' replication methods. In replication methods a series of sub-samples is derived from the full sample, and the statistic of interest is generated for each sub-sample. The variance is then estimated by calculating the variability in the estimate between these sub samples. This technique generates an estimate of the standard error of the estimate and the confidence interval is 1.96 times the standard error.

Administration

So as to ensure the smooth operation of the system and to assure data quality, test administrators travelled to each school with the notebook computers to manage the process. The assessment was administered to groups of ten students (nine in the case of the mini-lab method) in two testing sessions during the school day. Students sampled for the assessment were withdrawn from regular classes and completed the assessment in a designated area of the school where the computer equipment was located. The administration took place between 1 October and 17 November 2008 with the peak activity being between 20 October and 7 November (this period covered two-thirds of all schools).

Summary

The NAP-ICTL08 was the second cycle of assessment of ICT Literacy among Australian school students. As was the case for the assessment in 2005 it focussed on students in Years 6 and 10. It was based on the assessment framework from that first cycle with some extensions that took account of the national *Statements of Learning* for ICT that had been developed since 2005 (AESOC, 2006) as well as the emergence of more interactive communication modes in ICT. The assessment was designed so that there was a core of three modules that had been used in the first cycle and four new modules developed for NAP-ICTL08. This was to enable the measurement of changes in ICT Literacy between 2005 and 2008 as well as to allow the assessment to take account of new developments. The delivery methods made greater use of school computing resources with the most common delivery method being the installation of a local server containing all the assessment software on school computer networks. The assessment was completed by a sample of just a little fewer than 11,000 students from just under 600 schools across Australia. The survey was administered during October and early November 2008.

Chapter 3
A National Profile of ICT Literacy

The responses of the students to the assessment items or tasks from seven assessment modules (three of which were common to the assessment in NAP-ICTL05) provide the basis for the national profile of ICT literacy in 2008. From these data it is possible to generate a national profile of ICT literacy in 2008 focussing on Years 6 and 10 across Australia as a whole. The national profile of ICT literacy in 2008 is represented by descriptive summary statistics for the reporting scale, the frequency distribution of student scores over six proficiency levels and the percentage of students who attained the proficient standard. The reporting scale, the cut-points defining the proficiency levels and the proficient standard were defined in NAP-ICTL05. As a consequence of including a sufficient number of common tasks from the assessment instrument in NAP-ICTL05, these data for 2008 can be compared directly with the corresponding data for 2005. This chapter reports both the results for NAP-ICTL08 and comparisons with the results for NAP-ICTL05.

The ICT Literacy Scale

Analysis methods

An account of the analysis methods used in NAP-ICTL08 is provided in the technical report. This section provides a brief outline of the methods. The one-parameter IRT model (the Rasch model) was used as the basis for the analyses of the student response data from NAP-ICTL08. The use of Rasch

measurement models was consistent with the procedures used for other National Assessment Programs in Science and Civics and Citizenship and the processes are consistent with those used in other programs such as the OECD's Programme for International Student Assessment (PISA).

A consequence of using Rasch models as a basis for the analysis is that the difficulty of all the tasks in the assessment and the performance of all students who participated in the study can be placed on the same scale. A further benefit is that the Rasch model can be used to equate scores from the different modules completed by students even though individual students completed different combinations of modules. The difficulties of all the tasks in each module can be placed on the same scale because there is a sufficient number of students completing each possible combination of modules.

For students the scale represents the probability of a student completing a given task successfully. In terms of tasks the scale represents the proportion of students who complete the task successfully. The scale is expressed in Logarithmic units (Logits) with an arbitrary zero. Items represented towards the top of the scale are increasingly difficult and students represented towards the top of the scale are increasingly capable in terms of ICT literacy. Items towards the bottom of the scale are increasingly easy and students towards the bottom of the person scale have demonstrated less capability on ICT literacy.

Figure 3.1 displays the relative difficulty of all the items and the performance of all the participants in the study on the scale. The distributions of Year 6 and Year 10 student performance are displayed separately.

This representation is useful to gauge how well the items and their relative difficulty are targeted to the sample and to indicate the distributions of the two Year levels. The items cover the full range of abilities displayed by the students with both upper and lower extremes covered and a high proportion of items in the mid range. There is an overlap between Year 6 and Year 10 students with both distributions being relatively normal but each having a 'tail' of students who have relatively low capability in ICT literacy. There are a few Year 10 students who perform in the same range as the lowest 20 per cent of Year 6 students.

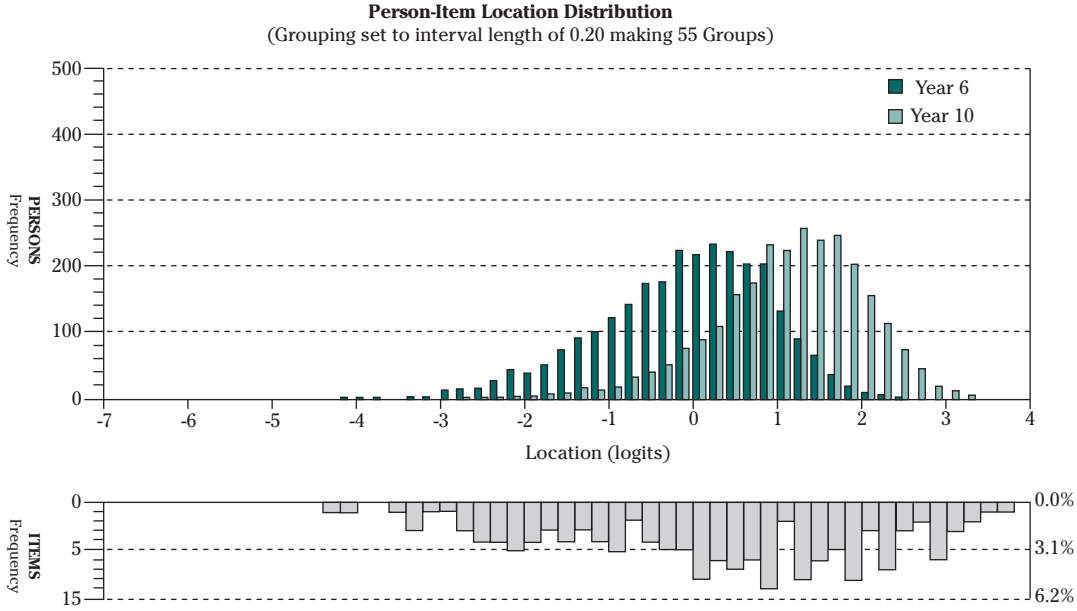


Figure 3.1: Distributions of Student ICT Literacy and Task Difficulties in 2008

Equating Year 6 and Year 10 in 2008

The assessment instrument contained seven modules of which each student completed four. Six of the modules were for students from either Year 6 or Year 10 and one, a more sophisticated and challenging module was only available to Year 10 students. Across the modules there were 107 tasks common to both Year levels and potentially available for comparing the relative performance of the Year 6 and Year 10 students (although not all of these were used in practice).

An analysis of the manner in which the common items measured ICT Literacy at Year 6 compared to Year 10 was undertaken and only those items that functioned similarly at both Year levels were used to establish the relative performance of Year 6 and Year 10 students. Items which functioned differently at the two Year levels did not inform the calibration of the comparisons as they could be manifestations of attributes different from, or in addition to, ICT literacy. In the final analysis 37 items were used to link the Year 6 and Year 10 student responses.

Equating NAP-ICTL05 and NAP-ICTL08

A major outcome of NAP-ICTL05 was the establishment of a scale of ICT literacy. In NAP-ICTL08 three assessment modules from NAP-ICTL05 were included along with four new modules. Rasch analysis enabled the new items to be placed on the established ICT literacy scale. Consequently this also enabled the results from NAP-ICTL08 to be compared directly with those from NAP-ICTL05. The three modules that had been used in 2005 were the General Skills Test (GST),

Photo Album (PHA) and DVD Day (DVD). These had been maintained as secure following NAP-ICTL05.

The same methodology used to assess the consistency of the manner in which items functioned in Year 6 and Year 10 was applied to the items from the modules common to 2005 and 2008 to determine which items were suitable for use as calibration links between 2005 and 2008. Of the 60 items available to be included, the analysis resolved that 39 items had performed sufficiently uniformly to be included in the final determination of the results of the 2008 study compared to the ICT literacy scale established in 2005.

Reporting ICT Literacy

ICT Literacy Reporting Scale

A reporting scale for ICT Literacy was established in 2005 with the Year 6 cohort being defined as having a mean scale score of 400 and a standard deviation of 100 scale score units. The Year 10 mean and standard deviation in 2005 were determined by the performance of Year 10 relative to the Year 6 parameters. For Year 10 the mean was 551 and the standard deviation was 98. Using the equating procedure outlined above it was possible to record the results for NAP-ICTL08 on the scale that had been established in 2005. In 2008 the Year 6 mean was 419 (with a standard deviation of 115) and the Year 10 mean was 560 (with a standard deviation of 107).

Reporting as Proficiency Levels

Although scale scores provide one succinct way of reporting ICT literacy overall and for comparisons of different groups of students, it is also possible to provide a profile of students' ICT literacy in terms of proficiency levels. Six Proficiency Levels were defined in NAP-ICTL05 and descriptions were developed to characterise typical student performance at each level. To form the proficiency levels, the continuum of increasing ICT literacy was divided into six levels of equal width (i.e. an equal range of student ability/item difficulty on the scale) with the bottom and top levels being unbounded at each extreme. Cut scores for each proficiency level were defined in 2005 and those same cut-scores were applied to the 2008 data. In the report of the 2005 survey the cut scores were determined on the logit scale and shown in terms of the reporting scale but an error was made in recording the transformed scores. The scale point cut scores shown in the 2005 report should have been the same as those shown in this report. The cut scores for the proficiency levels are shown in Table 3.1.

Table 3.1: Cut Scores for Proficiency Levels

Level	Reporting Scale Score at Cut-Point	Cut Score in logits
Level 6		
	769 scale points	3.50 logits
Level 5		
	649 scale points	2.25 logits
Level 4		
	529 scale points	1.00 logits
Level 3		
	409 scale points	-0.25 logits
Level 2		
	289 scale points	-1.50 logits
Level 1		

Information about the items in each level was used to develop summary descriptions of the ICT literacy associated with different levels of proficiency. These summary descriptions encapsulate the ICT literacy of students associated with each level. As a set, the descriptions represent growth in ICT literacy. The levels are not discrete discontinuous steps but are a method of representing progress. The newly developed assessment modules for NAP-ICTL08 have enabled the detailed ICT literacy proficiency descriptors to be updated with some new examples of ICT literacy achievement. The texts of the proficiency level descriptions established in NAP-ICTL05 remain valid and are shown in Table 3.2. The updated examples of achievement by proficiency level have been included as Appendix 2.

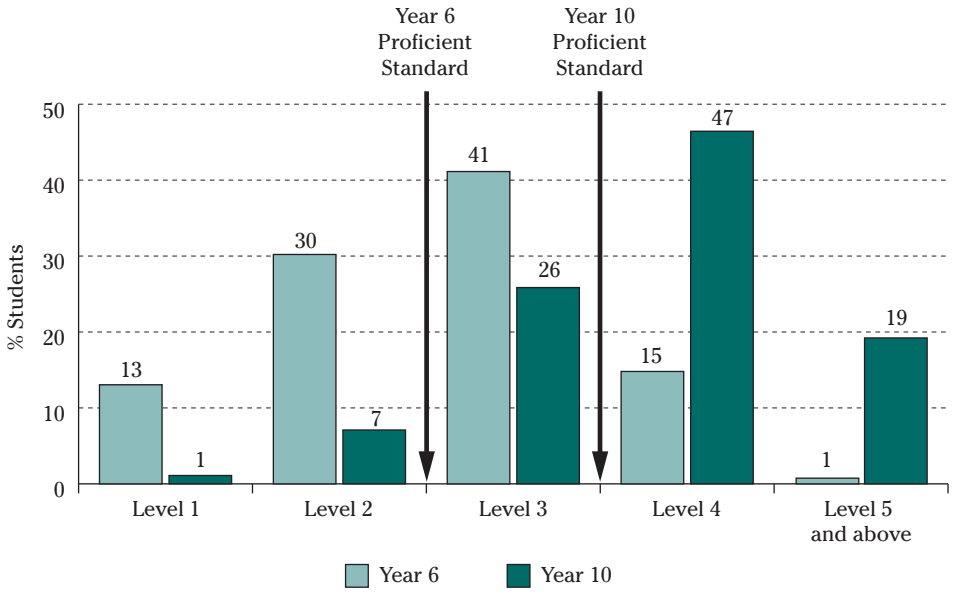
Table 3.2: ICT Literacy Proficiency Level Descriptions 2008

Level	Proficiency level description	% Yr 6	% Yr 10
6	Students working at level 6 create information products that show evidence of technical proficiency, and careful planning and review. They use software features to organise information and to synthesise and represent data as integrated complete information products. They design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work.	0.0	1.1
5	Students working at level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products.	1.0	18.2
4	Students working at level 4 generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this.	15.1	46.7
3	**Proficient Standard Year 10** Students working at level 3 generate simple general search questions and select the best information source to meet a specific purpose. They retrieve information from given electronic sources to answer specific, concrete questions. They assemble information in a provided simple linear order to create information products. They use conventionally recognised software commands to edit and reformat information products. They recognise common examples in which ICT misuse may occur and suggest ways of avoiding them.	40.6	25.6
2	**Proficient Standard Year 6** Students working at level 2 locate simple, explicit information from within a given electronic source. They add content to and make simple changes to existing information products when instructed. They edit information products to create products that show limited consistency of design and information management. They recognise and identify basic ICT electronic security and health and safety usage issues and practices.	30.3	6.9
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	13.0	1.5

Table 3.2 describes the typical skills, attributes and knowledge that are manifestations of students performing within each proficiency level. The table also shows the percentage of students at each Year level whose performance has resulted in their assignment to a particular level. Table 3.2 and Figure 3.2 show the distribution of ICT Literacy across the six proficiency levels described.

Proficiency level percentages in Table 3.2 (and those illustrated in Figure 3.2) show that overall Year 10 students are operating approximately one proficiency level higher than Year 6 students across the scale. Table 3.2 also shows that a higher proportion of Year 6 students are at the lower end of the Year 6 distribution than the corresponding proportion for Year 10. Approximately 43

per cent of Year 6 students are working at proficiency levels 1 and 2 whereas approximately 34 per cent of Year 10 students are working at proficiency levels 1, 2 and 3 (with only two per cent of Year 10 students at level 1).



Note: Percentage for Year 10 at Level 1 is 1.5% (see Table 3.2)

Figure 3.2: Distributions of ICT Literacy across Proficiency Levels in 2008

ICT Literacy Proficient Standards

The proficient standards represent points on the proficiency scale that represent a 'challenging but reasonable' expectation for typical Year 6 and 10 students to have reached by the end of each of those years of study. The concept of "proficiency standard" refers to the knowledge, skills and understanding that one would expect to observe in a student who was functioning adequately for their Year level. Clearly proficiency at Year 6, and the expectations of a Year 6 performance, is different to what one would expect to exhibit as proficiency for a Year 10 student. The Year 6 and Year 10 proficient standards were established in NAP-ICTL05 as a result of consultations (over two days for each Year level) with ICT education experts and representatives from all states and territories and all school sectors. The standards-setting groups included currently practising teachers with specific ICT expertise, ICT curriculum experts and educational assessment experts. The process of establishing the proficiency cut-points for each of Years 6 and 10 was described in the report of NAP-ICTL05 (MCEETYA, 2007).

The proficient standard for Year 6 was established as the boundary between levels 2 and 3 equal to a score of 410 on the ICT literacy scale. From Table 3.2 it can be seen that in 2008 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard. The proficient standard for Year 10 was established as the boundary between levels 3 and 4 equal to a score of 529 on the ICT literacy scale and in 2008 66 per cent of Year 10 students reached or exceeded the Year 10 proficient standard.

Changes from 2005 to 2008

Mean scores for Year 6 and Year 10

Table 3.3 shows the comparison of the performance of Year 6 and Year 10 students over the two cycles of ICT literacy assessment. Those data suggest that in the second cycle (NAP-ICTL08) there has been an improvement in the average performance of both Year 6 and Year 10 students. The improvement of 19 scale points at Year 6 is statistically significant but the improvement of nine scale points at Year 10 is not statistically significant. Until there is a third data collection we cannot determine if this constitutes a trend. However the combined data do more to support the contention that ICT literacy is improving over time rather than decreasing or remaining constant.

Table 3.3: Differences in ICT Literacy for Years 6 and 10 in 2005 and 2008

	Year 6		Year 10	
	Mean Score	Confidence Interval	Mean Score	Confidence Interval
2005 cycle	**400.0**	±6.3	550.6	±5.7
2008 cycle	**418.7**	±6.9	560.0	±7.1
Difference	**18.7**	**±12.6**	**9.4**	**±12.5**

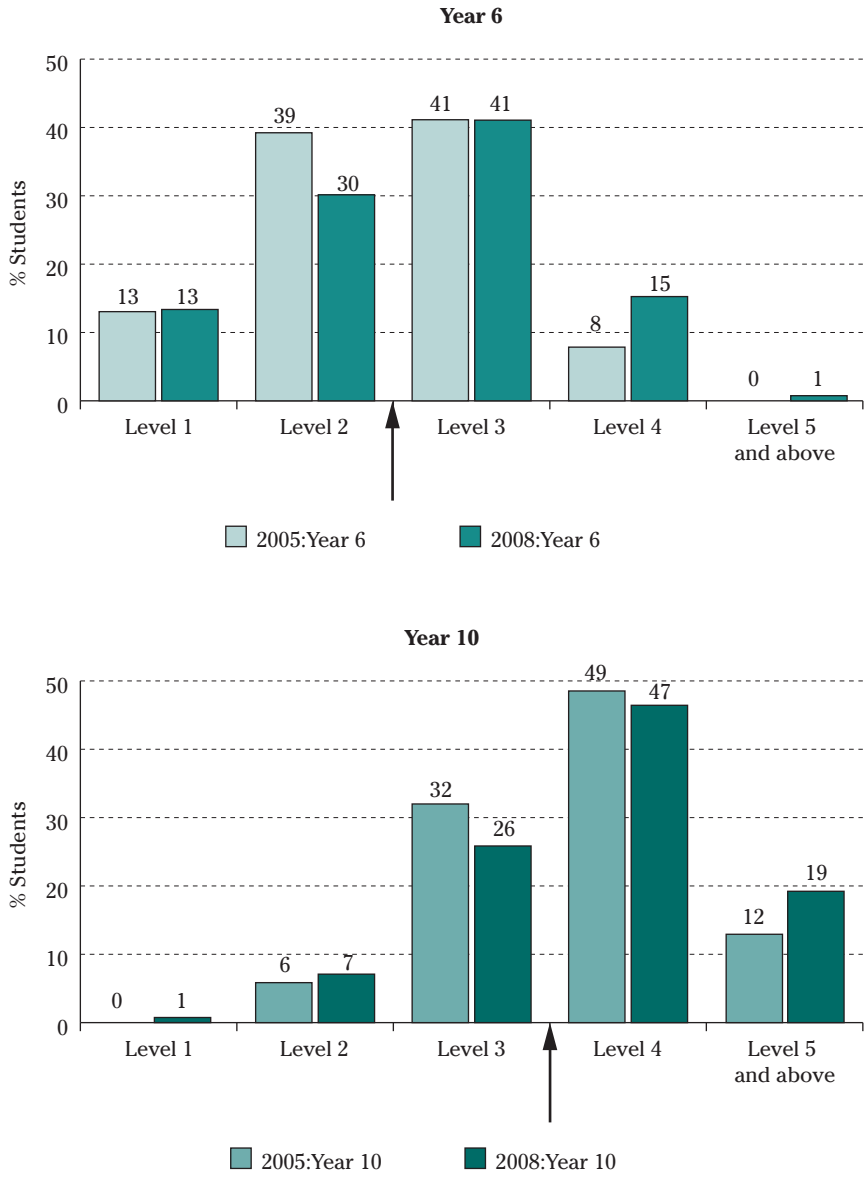
Notes: Confidence intervals for differences between cycles and year levels include estimated equating error.
Difference between mean Year 6 scores in 2005 and 2008 is statistically significant and those means are bolded.

Distributions over Proficiency Levels for Year 6 and Year 10

The changes observed in the mean scores achieved at each Year level is reflected in the distributions of the percentages of students in each of the proficiency levels. Table 3.4 provides a comparison of the percentage of students in each Proficiency Level by Year level and for the assessment cycles in 2005 and 2008. Figure 3.3 shows the same results in graphical form.

Table 3.4: Percentage Distribution of Year 6 and Year 10 Students across Proficiency Levels on the ICT Literacy Scale in 2008 and 2005

	Level 1 & Below		Level 2		Level 3		Level 4		Level 5 & Above	
	%	CI	%	CI	%	CI	%	CI	%	CI
Year 6										
2005	12.6	±1.6	38.8	±2.3	40.8	±2.7	7.7	±1.5	0.1	±0.1
2008	13.0	±1.7	30.3	±2.0	40.6	±2.3	15.1	±1.6	1.0	±0.5
Year 10										
2005	0.4	±0.3	6.4	±1.2	32.0	±2.9	48.9	±2.7	12.3	±1.7
2008	1.5	±0.5	6.9	±1.5	25.6	±2.2	46.7	±3.0	19.3	±2.3



Note: a) Proficient standard for each Year level is designated with arrow.
b) Percentages for Year 10 in 2005 at Level 1 is 0.4% and Level 2 is 6.4% which sum to 6.8% rounded to seven per cent for Levels 1 and 2 combined.

Figure 3.3: Distributions over Proficiency Levels for Year 6 and 10 Students in 2005 and 2008

At Year 6 there was a shift between 2005 and 2008 in the distribution from Level 2 to Levels 4 and 5 such that a decrease in the percentage of students in Level 2 in 2008 (by eight percentage points) and an increase in the percentage at Level 4 (by seven percentage points) was observed. The percentage at Level 3 remained constant. This difference indicates that a significant proportion of Year 6 students have attained relatively higher level skills than was observed in the 2005 study.

At Year 10 the percentage of students in the lowest two proficiency levels remains relatively unchanged with seven per cent in 2005 and eight per cent in 2008. However, between 2005 and 2008, there was a decline of six percentage points in the percentage of students in Proficiency Level 3 and an increase of

seven percentage points in Proficiency Level 5 and above. The percentage of students in Proficiency Level 4 remained relatively constant. These results can be observed in Figure 3.3. As for Year 6, there is a tail that has remained about the same but for the main group of Year 10 there has been an upward shift in the distribution.

Percentages of students attaining the proficient standard in 2005 and 2008

Table 3.5 shows percentage of students who attained the proficient standard in each Year level and compares the percentages achieving those standards in 2008 compared to 2005. The table shows that from 2005 to 2008 there was an increase of eight percentage points (from 49 to 57 per cent) in the proportion of Year 6 students who achieved the proficient standard. At Year 10 the increase was five percentage points (from 61 to 66 per cent) in the percentage who achieved the proficient standard but this was not statistically significant.

Table 3.5: Percentages of Year 6 and Year 10 Students attaining the Proficient Standard in ICT Literacy in 2008 and 2005

	Year 6		Year 10	
	Percentage	Confidence Interval	Percentage	Confidence Interval
2005 Cycle	**48.6**	±3.0	61.2	±3.1
2008 Cycle	**56.7**	±2.8	66.0	±3.0

Notes: Difference between percentages for Year 6 in 2005 and 2008 is statistically significant and those figures are bolded.

Summary

Student responses to the items that made up the various modules in the ICT literacy assessment were manifestations of a single underlying dimension of ICT literacy. Those items formed a scale that ranged from less to greater ICT literacy that could be measured reliably. The ICT literacy scale could be described in terms of six Proficiency Levels that provide a profile of progress in ICT literacy. This ranges from students at level 1 who "perform basic tasks using computers and software, implementing commonly used file management and software commands and recognising most commonly used ICT terminology and functions" to students at level 6 who "are able to create information products that show evidence of technical proficiency, careful planning and review, use software features to organise information, synthesise and represent data as integrated information products, design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work."

In 2008 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard by demonstrating the ability to "generate simple general search

questions and select the best information source to meet a specific purpose, retrieve information from given electronic sources to answer specific, concrete questions, assemble information in a provided simple linear order to create information products and use conventionally recognised software commands to edit and reformat information products". Sixty-six per cent of Year 10 students reached or exceeded the Year 10 proficient standard by demonstrating the ability to "generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose, create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose." At Year 6, but not at Year 10, there was a statistically significant increase in the percentage of students at or above the Proficient Standard, and in the mean ICT literacy score between 2005 and 2008.

Chapter 4
Patterns of ICT Literacy

In addition to understanding the national profile of ICT literacy among students in Year 6 and 10 in 2008 it is important to know the extent to which variations in ICT literacy are associated with other factors. ICT is part of life in modern society and students who do not develop proficiency in ICT are likely to be limited in their participation in economic and social life. Education is a responsibility of State and Territory authorities so the survey data are used to investigate variations in ICT literacy among States and Territories. The chapter also reports on differences in ICT literacy between females and males and between groups of students based on socioeconomic background, Indigenous status, language background, school location and age.

Two measures are used as the basis of the investigation of differences in ICT literacy among groups of students. The first is to compare the mean achievement scores of groups on the ICT literacy scale. This is the most robust comparison because it makes use of the full distribution of data and provides the best overall measure of comparison between groups. The second is to compare the percentages of students from each group who have attained the proficient standard for the Year level. This provides the specific measure of comparison against the expert-defined reasonable standards across Years 6 and 10. The focus is on results for 2008 but reference is also made to 2005.

Differences among States and Territories

Comparison of means in 2008

Tables 4.1 and 4.2 show the mean ICT literacy score for each State and Territory together with the 95 per cent confidence intervals that indicate the score range in which it is very likely (i.e. 95 per cent of the time) the true mean for each State and Territory actually lies [4]. Those data show some variation among States and Territories.

The differences between the second highest and second lowest mean scores for jurisdictions are 55 and 29 scale points for Year 6 and Year 10 respectively (which is similar to the range reported in 2005). The proficiency levels described in Chapter 3 each have a width of 129 scale points so these differences of 55 and 29 scale points represent approximately 0.4 and 0.2 of a proficiency level respectively. For Year 6 the mean scores for the Australian Capital Territory, Victoria and South Australia were significantly higher than the national mean and the means for Queensland and the Northern Territory were significantly lower than the national mean.

For Year 10 the mean for the Australian Capital Territory was significantly higher than the national mean and the mean for the Northern Territory was significantly lower than the national mean. The large confidence interval for the Northern Territory is a result of the large standard deviation (or spread of scores) in that jurisdiction in combination with a small sample size.

Table 4.1: Means for ICT Literacy by State and Territory for Year 6 in 2005 and 2008

	Year 6				
	2005 cycle		2008 cycle		Significance of difference (2005 - 2008)
	Mean Score	Confidence Interval	Mean Score	Confidence Interval	
Australian Capital Territory	**428.4**	±22.1	**471.6**	±13.9	Yes
Victoria	**423.5**	±13.7	**447.0**	±15.1	Yes
South Australia	411.9	±11.4	**438.5**	±12.5	Yes
New South Wales	404.9	±12.9	412.8	±14.5	No
Tasmania	404.2	±19.4	408.0	±16.4	No
Western Australia	**379.4**	±10.8	403.4	±11.5	Yes
Queensland	**369.6**	±12.3	**392.2**	±11.8	Yes
Northern Territory	345.8	±53.7	**364.1**	±49.8	No
ALL	**400.0**	**±6.3**	**418.7**	**±6.9**	**Yes**

Notes: 1) Jurisdictional means that differ significantly from the national mean within a Year level and cycle are shown in bold.

2) All tests of statistical significance based on t-tests for the difference between means and include equating error.

4 Because only a sample of students (and not all students) in each State and Territory completed the assessments, the means in this report represent estimations of the true mean in each State and Territory. The reporting of confidence intervals reflects the level of precision with which the means have been measured. Smaller confidence intervals represent more precise measurement.

Table 4.2: Means for ICT Literacy by State and Territory for Year 10 in 2005 and 2008

	Year 10				
	2005 cycle		2008 cycle		Significance of difference (2005 - 2008)
	Mean Score	Confidence Interval	Mean Score	Confidence Interval	
Australian Capital Territory	571.8	±17.8	**597.9**	±14.5	Yes
Victoria	565.1	±9.8	568.7	±18.1	No
New South Wales	550.6	±13.1	563.5	±13.7	No
South Australia	547.1	±11.0	560.2	±11.5	No
Western Australia	535.3	±11.8	559.3	±12.1	Yes
Queensland	546.6	±11.6	548.5	±14.0	No
Tasmania	538.1	±11.8	539.2	±16.3	No
Northern Territory	**515.3**	±28.2	**466.3**	±71.5	No
ALL	**550.6**	**±5.7**	**560.0**	**±7.1**	**No**

Notes: 1) Jurisdictional means that differ significantly from the national mean within a Year level and cycle are shown in bold.

2) All tests of statistical significance based on t-tests for the difference between means and include equating error.

Changes from 2005 to 2008 in jurisdictions

From Tables 4.1 and 4.2 it can also be seen that the observed improvement in national mean ICT literacy scores between 2005 and 2008 in both Years 6 and 10 is manifest in either improvement or stability in ICT literacy scores in all jurisdictions except for Year 10 in the Northern Territory. At Year 6 these differences are statistically significant in five jurisdictions (Victoria, Queensland, South Australia, Western Australia and the Australian Capital Territory), and at Year 10 these differences are statistically significant in Western Australia and the Australian Capital Territory.

Multiple comparison of means for Year 6 and Year 10 in 2008

To determine which jurisdictional differences were statistically significant multiple comparisons were conducted. Table 4.3 records which of the multiple comparisons of Year 6 jurisdictional means are statistically significant at the five per cent level. The simple pair-wise comparisons are shown in lower left-hand quadrant of Table 4.3 as a series of symbols to indicate whether the difference for the comparison is statistically significant or not. Those comparisons that are statistically significant are indicated by the upward or downward-pointing symbols and those that are not are indicated by the dot.

Table 4.3: Multiple Comparisons of Mean Year 6 ICT Literacy by State and Territory (2008)

	Mean	CI	ACT	VIC	SA	NSW	TAS	WA	QLD	NT
Australian Capital Territory	471.6	±13.9		●	▲	▲	▲	▲	▲	▲
Victoria	447.0	±15.1	●		●	▲	▲	▲	▲	▲
South Australia	438.5	±12.5	▼	●		▲	▲	▲	▲	▲
New South Wales	412.8	±14.5	▼	▼	▼		●	●	▲	●
Tasmania	408.0	±16.4	▼	▼	▼	●		●	●	●
Western Australia	403.4	±11.5	▼	▼	▼	●	●		●	●
Queensland	392.2	±11.8	▼	▼	▼	▼	●	●		●
Northern Territory	364.1	±49.8	▼	▼	▼	●	●	●	●	

Notes: Read across the row to compare one jurisdictions mean with other jurisdictions. The source and comparison jurisdictions are listed as the row and column headings respectively.

Results in the lower left-hand quadrant do not include the Bonferroni adjustment. Results in the upper right-hand quadrant incorporate the Bonferroni adjustment. This adjustment takes account of the fact that in multiple comparisons some difference might be significant by chance.

Legend *Significantly higher* ▲
Not significantly different ●
Significantly lower ▼

From Table 4.3 it can be seen that:

- The mean score for the Australian Capital Territory was significantly greater than that for all jurisdictions except Victoria;
- The mean scores for the Australian Capital Territory, Victoria and South Australia are significantly higher than the means for the remaining jurisdictions;
- The mean score for New South Wales is not significantly different from the means for Tasmania, Western Australia or the Northern Territory; and
- The mean score for New South Wales is significantly higher than the mean score for Queensland.

The mean score for the Northern Territory is substantially lower than the next lowest jurisdictional score but this does not appear as statistically significant because of the large standard error (or confidence interval) associated with the estimate for the Northern Territory.

Table 4.4 records the multiple comparisons of Year 10 jurisdictional means following the same procedure as was followed for the Year 6 means. It can be seen that fewer of the differences at Year 10 were statistically significant than was the case at Year 6.

Table 4.4: Multiple Comparisons of Mean Year 10 ICT Literacy by State and Territory (2008)

	Mean	CI	ACT	VIC	NSW	SA	WA	QLD	TAS	NT
Australian Capital Territory	597.9	±14.5		▲	▲	▲	▲	▲	▲	▲
Victoria	568.7	±18.1	▼		●	●	●	●	▲	▲
New South Wales	563.5	±13.7	▼	●		●	●	●	▲	▲
South Australia	560.2	±11.5	▼	●	●		●	●	▲	▲
Western Australia	559.3	±12.1	▼	●	●	●		●	●	▲
Queensland	548.5	±14.0	▼	●	●	●	●		●	▲
Tasmania	539.2	±16.3	▼	▼	▼	▼	●	●		●
Northern Territory	466.3	±71.5	▼	▼	▼	▼	▼	▼	●	

Notes: Read across the row to compare one jurisdictions mean with other jurisdictions. The source and comparison jurisdictions are listed as the row and column headings respectively.

Results in the lower left-hand quadrant do not include the Bonferroni adjustment. Results in the upper right-hand quadrant incorporate the Bonferroni adjustment. This adjustment takes account of the fact that in multiple comparisons some difference might be significant by chance.

Legend *Significantly higher* ▲
Not significantly different ●
Significantly lower ▼

From Table 4.4 it can be seen that:

- The mean score for the Australian Capital Territory is significantly higher than those for all other jurisdictions;
- The mean scores for Victoria, New South Wales, South Australia, Western Australia and Queensland are not significantly different from each other; and
- The mean score for Tasmania is lower than the mean scores for the Australian Capital Territory, Victoria, New South Wales and South Australia but is not significantly different from Western Australia, Queensland or the Northern Territory.

The mean score for the Northern Territory is substantially lower than the next lowest jurisdictional score but this does not appear as statistically significant because of the large standard error (or confidence interval) associated with the estimate for the Northern Territory.

Comparison of percentages of students attaining the proficient standard in 2008

As outlined in Chapter 3 another representation of performance in ICT literacy is through the percentages of students attaining or exceeding a defined proficient standard. Table 4.5 records the percentages of students in each jurisdiction who attained or exceeded the proficient standard in 2005 and 2008. As would be expected these data show a similar pattern as the mean scores. In Year 6 there were statistically significant increases for Queensland, South Australia, Western Australia and the Australian Capital Territory. In other jurisdictions the increases were not statistically significant in Year 6. In Year 10 only in Western Australia was the increase in the percentage attaining

the proficient standard statistically significant. In all other jurisdictions except for the Northern Territory there was a tendency towards an increase that was not statistically significant.

For Year 6 in 2008 the Australian Capital Territory and Victoria have a significantly higher percentage attaining the proficient standard than Australia overall. For Year 10 in 2008, only the Australian Capital Territory has a significantly higher percentage attaining the proficient standard, and only the Northern Territory has a significantly lower percentage, than for Australia overall.

Table 4.5: Percentages Attaining the Proficient Standard for ICT Literacy by State and Territory in 2005 and 2008

	Year 6					Year 10				
	2005		2008		Diff. 05-08	2005		2008		Diff. 05-08
	%	CI	%	CI		%	CI	%	CI	
New South Wales	50.5	±6.6	54.6	±5.7	No	61.1	±7.6	66.9	±5.4	No
Victoria	57.9	±6.3	**66.1**	±6.5	No	66.5	±4.8	69.8	±6.7	No
Queensland	**37.7**	±5.3	48.2	±5.3	Yes	59.5	±7.4	61.9	±6.2	No
South Australia	51.7	±5.0	64.4	±5.3	Yes	61.4	±5.4	64.6	±4.9	No
Western Australia	**39.6**	±5.4	50.7	±4.1	Yes	55.8	±6.1	65.3	±5.9	Yes
Tasmania	48.9	±9.0	51.6	±7.0	No	56.4	±6.4	57.8	±7.4	No
Northern Territory	**36.0**	±10.0	**42.2**	±10.6	No	**48.6**	±13.2	**45.8**	±13.4	No
Australian Capital Territory	**58.4**	±12.5	**75.1**	±6.6	Yes	65.5	±11.4	**77.1**	±6.1	No
ALL	**48.6**	**±3.0**	**56.7**	**±2.8**	**Yes**	**61.2**	**±3.1**	**66.0**	**±3.0**	**No**

Notes: "Diff. 05-08" indicates whether the difference between the 2005 and 2008 estimates are statistically significant at the 0.05 level.
Differences that are significantly different from the national mean are shown in bold
"CI" refers to confidence interval

Distribution of students within jurisdictions over proficiency levels

The percentages of students in Proficiency Levels within jurisdictions are necessarily based on small numbers (especially in smaller jurisdictions) so that confidence intervals are often too large for the estimates to be interpreted meaningfully as indicators of change. Appendix 3 contains those data, sometimes for combined levels so as to improve precision, with the caveat that the confidence intervals may be quite wide.

Interpreting differences among States and Territories in terms of student age

The sample, while designed to be representative of the student population, incorporates some structural differences that must be kept in mind when interpreting the results of the NAP–ICTL08. One important feature of the sample is that it is Year-based in order to be consistent with the reporting of literacy and numeracy performance in the National Report on Schooling in Australia. However, due to differences in school starting age, the length of time students

have spent in formal schooling varies between the States and territories. Table 4.6 shows the effect that the structural difference in Australian state and territory education systems have on the ages of students in the target populations. Compared to NAP-ICTL05 there has been a slight narrowing of the age difference between the youngest and the oldest states in Year 6 as a result of changes in the provisions for starting school.

Table 4.6: Percentage Distributions of Ages of Students Nationally, by State and Territory and by Year Level in 2008

Age	AUST	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Year 6									
10 and below	2.7	1.0	0.7	9.4	0.9	1.4	0.7	1.4	0.0
11	51.0	44.0	30.1	79.9	47.6	91.0	28.3	52.4	38.3
12	45.0	53.7	66.6	10.7	50.3	7.8	69.7	42.7	61.1
13 and above	1.2	1.3	2.6	0.0	1.2	0.1	1.4	3.6	0.5
Mean age (years)	12.0	12.1	12.2	11.6	12.0	11.6	12.2	12.0	12.1
Year 10									
14 and below	.8	0.5	0.5	10.0	1.3	10.8	0.5	4.5	0.8
15	54.7	45.7	35.5	77.8	55.8	84.7	27.6	57.4	37.7
16	40.1	52.4	61.2	11.6	41.4	4.4	70.4	34.9	60.7
17 and above	1.4	1.4	2.7	0.6	1.5	0.1	1.5	3.2	0.8
Mean age (years)	15.8	16.0	16.1	15.5	15.9	15.4	16.2	15.8	16.1

Differences in ICT Literacy between Males and Females

Table 4.7 shows the mean scores on ICT literacy for female and male students at Year 6 and Year 10. Nationally, in NAP-ICTL08, females recorded statistically significantly higher ICT literacy scores than males at both Year 6 (by 19 scale points) and Year 10 (by 16 scale points). At Year 6 the differences in favour of females were statistically significant within New South Wales and South Australia and at Year 10 the differences in favour of females were significant within Queensland and Tasmania. However, in all jurisdictions except one at Year 6 and one at Year 10 the direction of the difference tended to favour females (and those two cases the differences were very small indeed).

In 2005 (NAP-ICTL05), females also tended to record higher ICT literacy scores than males, but only at Year 6 was the difference statistically significant nationally. In every jurisdiction the tendency was for females to record higher scores than males but nowhere was the difference significant within a jurisdiction.

Overall, in 2008 it can be concluded that females record higher levels of ICT literacy than do males and this is consistent with the tendency observed in 2005. Of course, as shown in Table 4.8, the same pattern is observed in the percentages of females and males attaining the proficient standard. In both 2005

and 2008, and at both Year 6 and Year 10, a larger percentage of females than males tended to attain the proficient standard. This difference was statistically significant for both Year levels in 2008 but only for Year 6 students in 2005.

Table 4.7: ICT Literacy Scores for Male and Female Students at Year 6 and Year 10 in 2005 and 2008

State	2005				2008			
	Males		Females		Males		Females	
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	Mean Score	Conf. Interval	Mean Score	Conf. Interval
Year 6								
New South Wales	399.2	±19.6	411.6	±12.3	**401.1**	±12.7	**425.6**	±20.5
Victoria	419.5	±18.4	427.5	±12.7	440.7	±16.1	454.2	±19.6
Queensland	355.9	±16.5	382.9	±14.7	384.3	±14.4	402.9	±12.1
South Australia	400.1	±16.3	421.7	±14.3	427.6	±17.7	449.9	±14.8
Western Australia	375.3	±13.5	383.9	±13.3	395.3	±15.8	414.1	±15.6
Tasmania	402.7	±16.9	406.1	±25.1	392.8	±25.6	420.7	±15.8
Northern Territory	334.8	±52.1	362.9	±56.3	371.1	±43.4	369.9	±50.4
Australian Capital Territory	415.1	±27.6	437.9	±29.8	468.9	±28.1	474.3	±14.5
ALL	**392.9**	±9.2	**407.4**	±6.5	**410.2**	±7.3	**428.8**	±9.0
Year 10								
New South Wales	549.0	±15.7	552.5	±15.5	554.4	±20.5	577.1	±12.8
Victoria	561.8	±11.6	568.5	±16.7	573.8	±18.9	570.5	±19.7
Queensland	538.8	±17.2	554.2	±9.6	**534.2**	±15.1	**563.1**	±17.1
South Australia	539.1	±15.5	554.2	±15.5	556.3	±15.2	566.6	±14.0
Western Australia	526.9	±15.3	542.9	±12.0	550.9	±17.7	567.5	±10.7
Tasmania	534.1	±18.8	543.0	±16.9	**524.0**	±17.5	**554.5**	±19.5
Northern Territory	514.1	±30.0	516.7	±40.8	450.8	±92.7	485.9	±58.5
Australian Capital Territory	568.1	±29.0	575.2	±21.0	593.9	±26.5	602.6	±21.3
ALL	546.2	±7.6	555.4	±6.9	**553.9**	±9.1	**569.9**	±7.1

Note: Differences between males and females within Year level and cycle that are statistically significant at the .05 level are shown in bold.

Table 4.8: Percentage of Male and Female Students at Year 6 and Year 10 Attaining the Proficient Standard in 2005 and 2008

	2005				2008			
	Males		Females		Males		Females	
	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval
Year 6 (> Level 2)	**45.4**	±4.9	**52.0**	±4.1	**52.3**	±3.0	**61.8**	±3.6
Year 10 (> Level 3)	59.6	±4.2	62.9	±3.5	**63.2**	±3.9	**70.0**	±3.2

Note: Differences between males and females within each cycle that are statistically significant at the .05 level are shown in bold

Differences in ICT Literacy by Other Student Characteristics

It was possible to investigate the relationship of ICT literacy to sex, socioeconomic background, Indigenous status, language background and geographic location[5]. Mean scores for groups of students are recorded in Tables 4.9 through 4.12. Percentages of each group attaining the proficient standard are recorded as a consolidated record in Table 4.13.

Socioeconomic group

Parental occupation was used as the indicator of socioeconomic group[6]. The occupations of parents were provided by students and recorded in four categories following the PMRT classification: (1), senior managers and professionals; (2), other managers and associate professionals; (3), tradespeople and skilled office, sales and service staff; and (4), unskilled labourers, office, sales and service staff. Data have not been recorded for the category "not in paid work in the last 12 months" because the numbers in that category were very small and were too small to provide stable estimates of performance. Where occupations were available for two parents, the higher status occupation was used as the indicator of socioeconomic group. Mean scores for each group of students are recorded in Table 4.9.

Table 4.9: Differences in Mean ICT Literacy by Student Socioeconomic Background in 2005 and 2008

	2005		2008		Sig. Diff. 05-08
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	
Year 6					
Senior managers & professionals	**450.3**↑	±11.7	**461.5**↑	±7.6	No
Other managers associate professionals	**424.4**↑	±6.0	**445.8**↑	±9.2	Yes
Skilled trades, clerical & sales	**392.3**↑	±7.9	**411.4**↑	±8.6	Yes
Unskilled manual, office & sales	**363.1**	±8.5	**378.3**	±9.9	No
Year 10					
Senior managers & professionals	**586.2**↑	±9.4	**595.0**↑	±8.5	No
Other managers associate professionals	**560.3**↑	±7.0	**574.4**↑	±7.6	Yes
Skilled trades, clerical & sales	**542.4**↑	±6.6	**549.3**↑	±7.9	No
Unskilled manual, office & sales	**520.6**	±10.8	**529.2**	±9.9	No

Notes: a) Vertically adjacent percentages within Year level and cycle that are statistically significantly different are bolded.

b) "↑" designates that a value is significantly greater than that for the unskilled manual office and sales category.

c) Significant differences between 2005 and 2008 are designated in the right-hand column.

5 These data were gathered by means of an on-line survey of students which formed part of the assessment software. It was not possible to use data from school records at Year 6 as intended because of the very high, and uneven across jurisdictions, levels of missing data in those records.

6 Data based on parental education were not collected because in the field trial high levels of respondents indicated that they did not know their parents education.

The data in Table 4.9 show that the differences among socioeconomic groups are significant and substantial. At both Year 6 and Year 10 the differences between each group and the adjacent group are statistically significant. For Year 6 students the mean ICT literacy score of those students whose parents were in occupations classified as "senior managers and professionals" was 83 points higher than for those whose parents were in occupations classified as "unskilled manual, office and sales". For Year 10 students the corresponding gap was 66 points. The magnitudes in differences are very similar to those for the corresponding differences reported from 2005. In other words the relationship of ICT literacy to socioeconomic background is the same as it was in 2005.

Another way of representing these differences is through the percentages attaining the proficient standard. From Table 4.13 it can be seen that 72 per cent of Year 6 students whose parents had senior management or professional occupations attained the proficient standard compared with 41 per cent of Year 6 students whose parents held unskilled manual office or sales occupations, and for Year 10 the corresponding proportions are 78 per cent and 52 per cent meeting the proficient standard.

Indigenous status

Indigenous students' mean ICT literacy relative to that of non-Indigenous students is also recorded in Tables 4.10. At both Year levels, Indigenous students did not perform as well as non-Indigenous student on the ICT literacy assessment. The gap between the non-Indigenous and Indigenous students was similar at each Year level: 110 scale points at Year 6 and 113 scale points at Year 10. These differences are statistically significant and substantial (close to one proficiency level each on the scale). As shown in Table 4.13, some 59 per cent of non-Indigenous students in Year 6 attained the proficient standard compared with 24 per cent of Indigenous students. In Year 10 the corresponding figures were 68 per cent and 32 per cent. Moreover, the differences appear to be larger than were reported in the 2005 survey when the differences were approximately 70 scale points at each year level and the gap in the attainment of the proficient standard was approximately 20 percentage points for Yr 6 and 27 percent for Yr 10.

Table 4.10: Differences in Mean ICT Literacy by Indigenous Status in 2005 and 2008

	2005		2008		Sig. Diff. 05-08
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	
Year 6 students					
Non Aboriginal or Torres Strait Islander	**404.9**	±6.3	**426.4**	±6.6	Yes
Aboriginal or Torres Strait Islander	**338.5**	±23.3	**316.7**	±19.9	No
Year 10 students					
Non Aboriginal or Torres Strait Islander	**553.2**	±5.5	**566.7**	±6.1	Yes
Aboriginal or Torres Strait Islander	**482.0**	±23.5	**453.4**	±28.6	No

Notes: a) Vertically adjacent percentages within Year level and cycle that are statistically significantly different are bolded.

b) Significant differences between 2005 and 2008 are designated in the right-hand column.

Geographic location

Table 4.11 records the mean scores on the ICT literacy scale of students living in metropolitan, provincial and remote areas. At both Year 6 and Year 10 the tendency was for metropolitan students to record higher ICT literacy scores than did students in provincial areas who, in turn recorded higher scores than those in remote areas. Among Year 6 students, the difference between metropolitan and provincial students was statistically significant as was the difference between metropolitan and remote students. Among Year 10 students the differences in means between metropolitan and provincial, between metropolitan and remote students, and the difference between provincial and remote students, were all statistically significant. As shown in Table 4.13, the percentages of Year 6 students attaining the proficient standard were 61, 48 and 38 per cent for metropolitan, provincial and remote respectively and the percentages of Year 10 students attaining the proficient standard for metropolitan, provincial and remote locations were 69, 62 and 45 per cent.

Table 4.11: Differences in Mean ICT Literacy by Geographic Location in 2005 and 2008

	2005		2008		Sig. Diff. 05-08
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	
Year 6 students					
Metropolitan	**408.2**↑	±8.2	**431.6**↑	±7.8	Yes
Provincial	**385.9**↑	±9.7	**394.4**	±13.1	No
Remote	**344.9**	±47.9	353.7	58.7	No
Year 10 students					
Metropolitan	554.5↑	±7.3	**568.5**↑	±8.0	Yes
Provincial	**544.8**	±12.0	**550.0**↑	±12.4	No
Remote	**504.4**	±23.2	**489.5**	±41.4	No

Notes: a) Vertically adjacent percentages within Year level and cycle that are statistically significantly different are bolded.

b) "↑" designates that a value is significantly greater than that for remote locations.

c) Significant differences between 2005 and 2008 are designated in the right-hand column.

Language background

As shown in Table 4.12 there were no significant differences at either Year level between the mean ICT literacy scores of those with a language background other than English and those who spoke mainly English at home. This is consistent with the findings of the 2005 survey. In addition in 2008 the difference between ICT literacy scores of those students born in a predominantly English-speaking country and those born in a country where the predominant language was other than English were not statistically significant at either Year level. Data on students' country of birth were not collected in NAP-ICTL-05.

Table 4.12: Differences in Mean ICT Literacy by Language Background in 2005 and 2008

	2005		2008		Sig. Diff. 05-08
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	
Year 6 students					
Language at home					
English	399.9	±6.0	416.5	±6.7	Yes
Other than English	399.8	±12.3	428.0	±15.5	No
Main Language of Country of birth					
English (including Australia)	Not Reported		419.3	±6.9	
Other than English			419.8	±16.5	
Year 10 students					
Language at home					
English	552.8	±5.9	565.2	±6.3	Yes
Other than English	544.8	±11.2	552.2	±14.9	No
Main Language of Country of birth					
English (including Australia)	Not Reported		563.9	±6.3	
Other than English			549.4	±16.1	

Notes: a) No vertically adjacent means are statistically significantly different from each other.

Table 4.13: Differences in Percentages of Students Attaining the Proficient Standard in ICT Literacy by Student Characteristics at Year 6 and Year 10 in 2005 and 2008

	Year 6					Year 10				
	2005		2008		Sig. Diff. 05-08	2005		2008		Sig. Diff. 05-08
	Percent	Conf. Interval	Percent	Conf. Interval		Percent	Conf. Interval	Percent	Conf. Interval	
Parental occupation										
Senior managers & professionals	**68.0↑**	6.1	**71.7↑**	3.6	No	**75.4↑**	5.4	78.5↑	3.6	No
Other managers associate professionals	**58.9↑**	4.8	**66.2↑**	4.9	No	**65.7↑**	4.0	**70.7↑**	4.0	No
Skilled trades, clerical & sales	**46.1↑**	4.5	**54.0↑**	3.7	Yes	**57.1↑**	5.8	**62.6↑**	4.6	No
Unskilled manual, office & sales	**32.1**	5.7	**41.0**	4.7	Yes	**48.8**	7.0	**52.1**	6.0	No
Indigenous Status										
Non Aboriginal or Torres Strait Islander	**50.1**	3.1	**59.2**	2.8	Yes	**62.3**	3.1	**68.1**	2.7	Yes
Aboriginal or Torres Strait Islander	**29.9**	12.9	**24.2**	6.1	Yes	**35.0**	11.5	**31.6**	11.7	No
Language at home										
English	48.5	3.2	56.3	2.9	Yes	62.3	3.3	67.5	2.8	No
Other than English	48.8	6.2	58.9	6.0	No	58.6	5.6	64.0	5.9	No
Main Language of Country of birth										
English (including Australia)	Not reported		56.8	2.8		Not reported		67.4	2.8	
Other than English			58.1	7.5				61.3	7.2	
Geographic location										
Metropolitan	**51.9↑**	3.8	**61.3↑**	3.3	Yes	62.8↑	4.1	68.9↑	3.3	Yes
Provincial	**42.7**	5.5	**47.6**	5.7	No	58.6	5.7	**62.1↑**	5.6	No
Remote	32.6	18.9	38.3	12.7	No	45.8	9.7	**44.6**	10.6	No

Notes: a) Vertically adjacent percentages within Year level and cycle that are statistically significantly different are bolded.

b) Where there are more than two categories "↑" designates that a value is significantly greater than the base category for the set of categories.

c) In 2005 Year 6, the percentage for metropolitan is statistically significantly different from the percentage for remote.

d) Significant differences between 2005 and 2008 are designated in the relevant column.

Net Influences on ICT Literacy: Results of a Regression Analysis

The net influence of student characteristics on ICT literacy was examined using multiple regression analysis. This provides an indication of the effect of each influence on ICT literacy after allowing for the effects of associated variables. The analysis generates coefficients that provide an indication of the net influences of the predictor or independent variables in the analysis (e.g. parental occupation status) on the dependent variable (ICT literacy)[7]. The larger the coefficient is, the stronger the effect of that variable as a predictor on the dependent variable. Results of the regression analyses for students in Year 6 and students in Year 10 are shown in parallel in Table 4.14.

In Table 4.14 the magnitude of the regression coefficient (B) represents the size of the net effect of each predicator on the ICT literacy scale units. For a continuous variable the magnitude of the regression coefficient represents the net effect of a one unit difference in the predictor on the ICT literacy score. For a dichotomously coded variable (e.g. sex) the magnitude of the coefficient is the net effect of the difference between having that characteristic and not having that characteristic on the performance measure. Table 4.14 also indicates the percentage of the variance explained by the groups of independent variables on performance. It indicates how much of the variation in student scores can be accounted for by the combination of variables that have been included in the analysis to that stage. Two overall observations can be made from these data. The first is that the largest source of variation among those variables included was parental occupational group. The second is that most of the variation in students' ICT literacy is not accounted for by these variables representing student characteristics, as would be expected.

The analysis of influences on performance was conducted by entering blocks of variables in sequence. Of course at the final stage of the process the result is the same as if all variables had been analysed simultaneously. However, the block-wise process provides additional information. Firstly, the results at each stage indicate how much the model is improved by including additional blocks of variables. Secondly it is possible to examine changes in the regression coefficients as additional blocks are added and thus infer the extent to which the observed effects are direct or transmitted.

- Block 1 included age and sex.
- Block 2 included Indigenous status (Indigenous or not Indigenous) and language background other than English.

7 The confidence intervals are based on replication methods (specifically the Jack-knife method) so that they take account of the clustered sample structure. With the complex sample designs that are multi-level but also involve explicit and implicit stratification, differential sampling fractions between strata, probability proportional to size selection and other complexities empirical replication methods provide the most appropriate estimates of standard errors. In these analyses all the variables are student level except for state and that is simply a category - there are no school level variables in the analyses.

- Block 3 contained the variables concerned with parental occupation. Because parental occupation was coded in one of four groups it was represented as a set of dummy variables (coded as 0 or 1 to reflect whether the parental occupation was in that group)[8]. These were senior managers and professionals, other managers and associate professionals, tradespeople and skilled office, sales and service staff. The reference category was unskilled labourers, office, sales and service staff and the results for the other occupational groups are relative to that group.
- Block 4 is home location represented as a set of dummy variables (coded as 0 or 1 to reflect whether the student came from a metropolitan, provincial or remote area). Metropolitan location was the reference category and the results reported are relative to students in a metropolitan location.
- Block 5 is State or Territory represented as a set of dummy variables (coded as 0 or 1 for each state). Queensland is the reference jurisdiction (that was necessarily excluded from the analysis) and the results reported are relative to students in Queensland.

From the results of the regression analysis shown in Table 4.14 it can be seen that the student characteristics that had the greatest influence on ICT literacy were socioeconomic group and Indigenous status. Students whose parents were in the "senior manager and professional occupational" group had net ICT literacy scores between 73 (Year 6) and 57 (Year 10) scale points higher than those whose parents were in the "unskilled labourers, office, sales and service staff" group (the reference category). The differences above the reference category for children of the "other managers and associate professionals" group were 60 (Year 6) and 37 (Year 10) points and for children of the "tradespeople and skilled office, sales and service staff" the difference above the reference category were 29 (Year 6) and 19 (Year 10) points. These are effects of similar magnitude to those reported from the 2005 assessment of ICT literacy.

Indigenous students had ICT literacy scores that were lower than that of non-Indigenous students by 65 scale points at Year 6 and 78 scale points at Year 10. These are the effects after allowing for the effects of factors such as socioeconomic background and geographic location. They are larger effects than were reported from the 2005 assessment of ICT literacy.

There was a significant net effect of living in a remote location compared to living in a metropolitan location at both Year levels. Students from remote locations had lower ICT literacy scores than metropolitan students at Year 6 (54 points) and Year 10 (34 points). Students from provincial locations had

8 When categorical variables involving more than two categories are included in a regression analysis it is necessary to designate one category as the reference category and exclude that from the analysis. As a consequence the results that are obtained are relative to the reference category. It is conventional to choose as a reference category one which contains sufficient cases to have a relatively low confidence interval and one which is near either end of the distribution to facilitate interpretation. In these analyses the reference category for socioeconomic group was unskilled labourers, office, sales and service staff; for location the reference category was "metropolitan" and for jurisdiction the reference category was Queensland.

lower ICT literacy scores than their peers in metropolitan locations for Year 6 (26 points) and in Year 10 (14 points).

The effect of student sex was evident for both Year 6 and Year 10 with females having higher ICT literacy scores by 17 and 14 points respectively. Age had significant effects for both Year 6 and Year 10 with older students (within a given Year level) recording lower scores than younger students[9].

Table 4.14 also indicates the net effects for each State or Territory after allowance is made for the effects of differences in social and demographic characteristics. The data indicate the net difference between the listed jurisdiction and Queensland which was chosen as the reference. The overall pattern was the same at both Year 6 and Year 10 although the net effects are consistently lower at Year 10 than Year 6.

It could be concluded that Western Australia and the Northern Territory had net scores that are not different from those for Queensland. The other states have relatively, and statistically significantly, higher ICT literacy scores than Queensland.

The process of adjusting for other factors also reduced the extent to which ICT literacy in the Northern Territory was lower than in other jurisdictions. Victoria and the Australian Capital Territory are the highest scoring jurisdictions at both Year 6 and Year 10 (and it should be noted that this result is net of the influence of differences in the social composition of the student population in these jurisdictions). The results, which were consistent across two Year levels, suggest that it may be influences associated with the provision of ICT in schools that contributes to the observed patterns.

9 This finding is consistent with other national and international surveys of school achievement and is most commonly explained by the occasional practice of having some low achieving students repeat a year of schooling at some point during their time at school and that of accelerating high achieving students.

Table 4.14: Results of Regression Analysis of ICT Literacy on Student Characteristics (2008)

Predictor	Year 6 Students			Year 10 Students		
	Regression Coefficient (B)	Conf. Interval	Incremental Variance Explained (R-squared)	Regression Coefficient (B)	Conf. Interval	Incremental Variance Explained (R-squared)
Intercept						
b0	**358.6**	11.3		**517.4**	16.0	
Block 1			0.7%			1.6%
Age (years)	**-14.7**	10.0		**-27.9**	9.4	
Sex (female 1, male 0)	**16.9**	7.8		**13.7**	8.2	
Block 2			5.1%			4.4%
Indigenous (coded 1,0)	**-65.4**	17.1		**-77.9**	28.3	
Language other than English (coded 1,0)	-2.7	12.5		**-15.5**	12.7	
Block 3 (compared to students with parents in unskilled occupations)			5.6%			3.9%
Senior managers & professionals	**73.2**	11.1		**57.6**	11.3	
Managers & associate professionals	**60.2**	12.9		**37.4**	12.5	
Tradespeople, skilled office, sales service	**28.9**	11.1		**18.7**	11.1	
Block 4 (compared to metropolitan students)			1.4%			0.4%
Provincial location	**-25.9**	11.6		**-13.5**	12.5	
Remote location	**-53.5**	40.8		**-33.7**	19.9	
Block 5 (compared to Queensland students)			2.6%			1.7%
New South Wales	**28.2**	14.4		**29.8**	17.0	
Victoria	**54.0**	17.7		**37.2**	17.0	
South Australia	**47.5**	16.3		**19.4**	15.0	
Western Australia	9.1	12.9		3.1	16.8	
Tasmania	**37.1**	18.5		**16.5**	20.3	
Northern Territory	26.5	32.6		-6.2	33.3	
Australian Capital Territory	**61.4**	18.4		**50.3**	19.3	
Full model			15.4%			12.0%

Notes *a) Regression coefficients that are statistically significant are bolded.*

b) Reference categories for multiple categories represented by dummy variables are as follows:
Socioeconomic group is relative to unskilled labourers, office, sales and service staff;
Geographic location is relative to "metropolitan"; and
Jurisdiction is relative to Queensland.

Summary

The increase in students' ICT literacy between 2005 and 2008 previously described for the national pattern is reflected by a consistent trend for improvement across jurisdictions at both Years 6 and 10. At Year 6 there were statistically significant improvements in the mean ICT literacy scores of students in five jurisdictions and at Year 10 there were statistically significant improvements in two jurisdictions between 2005 and 2008.

Student background characteristics are related to ICT literacy and the patterns are similar in Year 6 and Year 10. The largest effects are associated with socioeconomic background. The analyses cannot indicate whether this is associated with differences in access to and opportunity to use ICT or other factors. Indigenous status is also strongly associated with ICT literacy and this association is stronger in 2008 than it was in the 2005. There was evidence of disadvantage in the development of ICT literacy for students from non-metropolitan locations. The effect was consistently observed in Year 6 and Year 10. The extent to which these differences are associated with access and opportunity will be explored in the next chapter. Finally, the analyses indicated that there were some differences among jurisdictions that could not be accounted for by differences in social and demographic characteristics.

Chapter 5
Familiarity with ICT

Compared to their peers in other OECD countries, Australian students have high levels of access to and use of computer technology at home and school. Data from the Programme for International Student Assessment (PISA) conducted in 2006 indicate that Australia has one of the highest levels of computer availability in secondary schools among OECD countries, with an average of 2.9 students per computer compared to an OECD average of 4.8 students per computer (OECD, 2007). The Australian student-computer ratio was similar to the ratios in the United States, the United Kingdom, Norway and Sweden. These Australian figures reflect an improvement in school computing resources in Australia over the six years since 2000 when there was an average of 4.5 students per computer.

Data from PISA 2006 also provide information about the extent to which 15-year-old students have access to computers at home with 97 per cent of Australian 15-year-old students indicating that they had a computer at home and 92 per cent had a connection to the internet. The OECD averages were 87 and 77 per cent respectively. PISA 2006 also revealed that 76 per cent of Australian 15-year-old students used a computer at home, and 24 per cent used a computer at school, almost every day. The corresponding figures for the OECD were 70 per cent and ten per cent.

Findings from the Trends in International Mathematics and Science Study (TIMSS) suggest similar high levels of access at home and school among primary school students in 2007. Eighty-nine per cent of Australian Year 8 students, and 84 per cent of Year 4 students, had a computer with a connection to the internet at home. The Year 8 figure was higher in only

Hong Kong, Norway, Sweden, Korea and England and Scotland (Mullis et al., 2008). The percentage of Australian Year 4 students indicating that they have a computer at home is comparable to the percentage in the United States, England and the Netherlands.

The IEA Second International Technology in Education Study (SITES) indicates that Australian science and mathematics teachers are relatively high users of ICT compared to their counterparts in other countries. A higher percentage of Year 8 science teachers in Australian secondary schools used ICT in the past year than in most other countries surveyed (similar to Singapore, Hong Kong SAR, and Alberta Canada). In addition, Australia was one of a group of countries in which a high percentage of Year 8 mathematics teachers used ICT (behind only Norway).

It is important to map the variations in use of ICT because there is some evidence of differences in access across socioeconomic groups and between metropolitan and non-metropolitan locations. The data gathered as part of the national sample study provide the opportunity to provide this mapping for Year 6 and Year 10 students.

Student Use of ICT

Two aspects of student use of ICT were investigated. The first was the length of time for which students had been using computers and the second was the frequency with which students used computers.

Student experience of using computers

Table 5.1 records the extent of time students in Year 6 and Year 10 had been using computers. From the data in Table 5.1 it is evident that the majority of students have five or more year's experience of using computers and that more than 95 per cent of Year 6 and Year 10 students had been using computers for one year or more. Between 2005 and 2008 there was a small increase in the percentage of students using computers for five years or more.

Table 5.1: Percentage of Students with Specified Years Experience of Using Computers (2005 and 2008)

	2005			2008		
	< 1 year	1 to 5 years	> 5 years	< 1 year	1 to 5 years	> 5 years
Year 6	5.2 (±1.0)	40.5 (±2.5)	54.3 (±2.7)	3.4 (±0.7)	40.2 (±2.1)	56.0 (±2.3)
Year 10	3.7 (±1.1)	32.3 (±2.1)	63.9 (±2.3)	2.4 (±0.6)	27.4 (±2.0)	69.5 (±2.0)

Note: Confidence intervals are shown in parentheses

There were just a few significant differences among States and Territories in experience of using computers. Details are recorded in Table 5.2. Among Year 6 students, there appear to be three groups of jurisdictions in terms of the percentages of students with more than five years experience of computer use. In Victoria, South Australia and the Australian Capital Territory more than 60 per cent of students are in that category. In New South Wales and Tasmania between 50 and 60 per cent of students have this much experience. In Queensland, Western Australia and the Northern Territory fewer than 50 per cent of students have five years experience of computer use. Among Year 10 students experience with computers was greatest in South Australia and the Australian Capital Territory and least in the Northern Territory and Queensland.

Table 5.2: Percentage of Students with more than Five Years Experience of Using Computers by Specified Characteristics in 2008

	Year 6		Year 10	
	% with >5 years usage	Confidence Interval	% with >5 years usage	Confidence Interval
State or Territory				
New South Wales	56.1	±4.2	67.3	±5.2
Victoria	64.4	±5.4	70.6	±4.4
Queensland	47.1	±4.5	63.6	±4.7
South Australia	63.8	±3.5	77.1	±3.0
Western Australia	49.5	±4.0	65.0	±2.8
Tasmania	55.2	±5.5	69.7	±3.3
Northern Territory	46.7	±6.4	60.3	±9.0
Australian Capital Territory	63.2	±8.2	77.6	±6.5
Socioeconomic group				
Senior managers & professionals	64.6	±3.4	76.1	±3.2
Other managers & associate professionals	58.3	±4.1	73.1	±3.6
Skilled trades, clerical & sales	53.9	±2.9	65.1	±3.0
Unskilled manual, office & sales	51.9	±4.1	59.0	±5.0

There were some significant differences in computer experience associated with socioeconomic background. Although not all differences between adjacent groups were statistically significant it was evident that the difference between the group “senior managers and professionals” and each of “skilled trades, clerical and sales” and “unskilled or skilled office and trade” were statistically significant at both Year 6 and Year 10. It can be concluded from these data that socioeconomic differences in computer experience exist between “unskilled or skilled office and trade” and “professional or managerial” and that these differences exist at both Year 6 and Year 10. This finding is the same as was reported for the 2005 survey.

Frequency of computer use

The frequency of computer use at home and at school is recorded in Table 5.3. It shows the percentage distribution across categories of usage at home and

at school. It also summarises these data in terms of an index representing the average number of days using computers per month. It can be seen that just fewer than 50 percent of the Year 10 students report using a computer at home at least once each day. This represents a higher frequency of daily use than for Year 6 students (for whom the corresponding figure was 30 per cent). There was no significant difference between Year 6 and Year 10 students in school usage. The data in Table 5.3 also indicate that daily home use of computers is much greater than daily school use.

Table 5.3: Percentage Frequency of Computer Use at Home and School for Year 6 and Year 10 Students in 2008

	Percentage frequency of computer use in 2008						Index	
	Never	Less than monthly	Weekly to monthly	Few times per week	Almost every day	At least once each day	Value (days per month)	Confidence interval
Computer use at home								
Year 6	4.0	3.3	8.6	29.4	24.5	29.7	**18.0**	(±0.4)
Year 10	2.7	1.3	3.6	18.3	25.0	48.3	**22.3**	(±0.4)
Computer use at school								
Year 6	0.9	3.5	19.6	54.2	13.3	8.0	11.7	(±0.5)
Year 10	0.9	3.8	17.9	45.0	21.6	10.0	12.2	(±0.5)

Notes: *Confidence intervals (95%) are shown in parentheses for the index*
Computer use at home is significantly greater for Year 10 than for Year 6 (shown as bold)

Although the response categories were a little different in 2008 than in 2005 there is evidence that home usage of computers increased substantially between 2005 and 2008 for both Year 6 and Year 10 students. The combination of the top two categories in 2008 ("almost every day" and "at least once each day") for home use was 54 per cent for Year 6 and 73 per cent for Year 10. In 2005 the top category was "almost every day" which was the response of 43 per cent of Year 6 students and 58 per cent of Year 10 students (MCEETYA, 2007: 64). On the basis of these categories of most frequent use there also appears to have been an increase in school computer usage. In Year 6 the increase between 2005 and 2008 was from 14 to 21 per cent and in Year 10 the increase was from 18 to 32 per cent. To examine differences in the frequency of computer use at home and at school across various groupings the index based on mean days per month was used. Data are recorded in Table 5.4.

Table 5.4: Variations in Monthly Computer Usage for Year 6 and Year 10 Students in 2008

	Year 6				Year 10			
	Home		School		Home		School	
	Index	Conf. Interval	Index	Conf. Interval	Index	Conf. Interval	Index	Conf. Interval
Sex								
Females	17.8	±0.5	11.6	±0.5	22.1	±0.5	**11.4**	±0.6
Males	18.1	±0.5	11.8	±0.6	22.5	±0.5	**13.0**	±0.6
Indigenous Status								
Indigenous	17.2	±1.4	12.9	±1.0	**18.8**	±2.2	12.5	±1.4
Non-Indigenous	18.0	±0.4	11.6	±0.5	**22.5**	±0.4	12.2	±0.4
Geographic location								
Metropolitan	**18.4**	±0.5	11.6	±0.6	**23.2**	±0.4	12.0	±0.5
Provincial	**17.0**	±0.5	12.1	±0.8	**20.3**	±0.7	12.5	±0.7
Remote	**14.9**	±2.3	10.6	±1.9	**17.2**	±2.9	14.8	±3.7
Language at home								
English	17.7	±0.4	11.6	±0.5	22.1	±0.4	12.1	±0.5
Other than English	18.7	±0.7	11.9	±0.9	22.9	±0.6	12.4	±0.7
Socioeconomic background								
Senior managers & professionals	18.1	±0.6	12.1	±0.8	**23.4**	±0.6	12.7	±0.6
Other managers & associate professionals	18.3	±0.8	11.1	±0.7	22.9	±0.7	12.1	±0.6
Skilled trades, clerical & sales	17.9	±0.7	12.1	±0.6	**22.0**	±0.6	12.1	±0.7
Unskilled manual, office & sales	18.2	±0.9	11.1	±0.6	**20.9**	±0.8	11.4	±0.7
State or Territory								
New South Wales	18.5	±0.8	10.0↓	±0.7	22.8↑	±0.7	9.7	±0.8
Victoria	18.7	±0.7	14.3↓	±1.3	23.0↑	±0.8	13.7	±0.9
Queensland	17.0	±0.8	11.0↓	±1.0	21.9	±0.8	12.8	±1.0
South Australia	17.4	±0.7	12.4	±0.8	22.4	±0.7	15.6	±1.1
Western Australia	16.9	±0.9	10.9↓	±0.8	20.9↓↓	±1.1	11.3	±0.9
Tasmania	17.3	±0.8	15.2↑↓	±1.4	19.7↓↓	±0.8	15.8	±1.1
Northern Territory	**15.5↓**	±1.7	12.4	±1.4	17.4↓↓	±3.1	17.7	±2.0
Australian Capital Territory	**18.8↑**	±1.4	10.9↓↓	±1.6	23.9↑↓	±0.8	13.5	±1.8

Notes: Mean days per month calculated on the basis of: Never = 0; less than monthly = 1; weekly to monthly = 2; few times per week = 12; almost every day = 20; at least once every day = 30.
For student characteristics vertically adjacent means that differ significantly are shown in bold
For jurisdictions ↑ indicates statistically greater than marked comparison and ↓ indicates statistically smaller than the marked comparison.
Statistical significance levels of differences among jurisdictions in school usage at Year 10 are shown in Table 5.5.

It can be seen in Table 5.4 that there was no significant difference in the frequency of computer use at home or at school between males and females among Year 6 students but there was a difference between male and female computer use at school among Year 10 students: males used computers at school a little more frequently than did females.

There was no significant difference between Indigenous and non-Indigenous students at Year 6 in terms of either home or school use although Indigenous students tended to have a higher usage at school and lower usage at home

than non-Indigenous in both years 6 and 10. Indigenous students in Year 10 recorded a statistically significant lower home use of computers than non-Indigenous students.

Home computer use was higher for students in metropolitan than in either provincial or remote locations (and there was also a difference between provincial and remote locations). This was evident at both Year 6 and Year 10. However, there was no significant difference in the frequency of computer use at school among Year 6 or Year 10 students from different geographic locations.

There are differences in the frequency of computer use among socioeconomic groups in Year 10. Year 10 students whose parents were "senior managers and professionals" recorded statistically significantly higher levels of computer use at home than those students whose parents were in either "unskilled manual, office or sales" or "skilled trades, clerical and sales" occupational groups. There were no differences in home computer usage across socioeconomic groups among Year 6 students or school computer use among socioeconomic groups at either Year 6 or Year 10.

There were few differences among jurisdictions in home computer use. Among Year 6 and Year 10 students, home computer usage was greatest in the Australian Capital Territory and lowest in the Northern Territory. The differences between other jurisdictions at Year 6 were not statistically significant. Among Year 10 students, it appeared that Victoria and New South Wales (as well as the Australian Capital Territory) had significantly higher levels of home computer use than Western Australia and Tasmania. The Australian Capital Territory, Victoria, New South Wales and South Australia had significantly higher levels of home computer usage than Tasmania and the Northern Territory.

There were differences among jurisdictions in school computer usage. Among Year 6 students, school computer use was significantly more frequent in Tasmania and Victoria than in New South Wales, Queensland, the Australian Capital Territory or Western Australia. In Year 10 the differences among jurisdictions are more complicated and have been shown in Table 5.5. Based on the data in Table 5.5 it can be concluded that in terms of school computer usage in Year 10:

- The Northern Territory, Tasmania and South Australia record the highest levels of school usage and are not statistically significantly different from each other;
- Victoria, the Australian Capital Territory and Queensland record the next highest levels of school usage of computers in Year 10 and they do not differ significantly from each other; and
- School computer usage in Year 10 is lower in Western Australia and New South Wales than in all other jurisdictions with New South Wales having less computer usage than Western Australia.

Table 5.5: Multiple Comparisons of School Computer Use at Year 10 by State and Territory (2008)

	Mean	CI	NT	Tas	SA	Vic	ACT	Qld	WA	NSW
Northern Territory	17.7	±2.0								
Tasmania	15.8	±1.1	●							
South Australia	15.6	±1.1	●	●						
Victoria	13.7	±0.9	▼	▼	▼					
Australian Capital Territory	13.5	±1.8	▼	▼	●	●				
Queensland	12.8	±1.0	▼	▼	▼	●	●			
Western Australia	11.3	±0.9	▼	▼	▼	▼	▼	▼		
New South Wales	9.7	±0.8	▼	▼	▼	▼	▼	▼	▼	▼

Notes: *Read across the row to compare one jurisdictions mean with other jurisdictions. The source and comparison jurisdictions are listed as the row and column headings respectively. The comparisons do not include the Bonferroni adjustment*

Legend: *Significantly higher* ▲
Not significantly different ●
Significantly lower ▼

Computer Applications

As part of the computer-based student survey students indicated the extent to which they used 20 specified computer applications. The frequencies with which all students in both Year 6 and Year 10 reported using these applications are recorded in Table 5.6. These applications are listed in four groups based on the results of exploratory and confirmatory factor analyses: school utilities, entertainment, social communication and computer technology. From these data it is possible to identify the most used and least used computer applications.

Overall use of computer applications

Overall social communication is the group of most frequently used applications followed by entertainment and school utilities with computer technology being the least frequently used group of applications.

Within the group social communication the most frequently used applications were email or "chatting" and searching the Internet for information that is not for study or school work. Nearly 30 per cent of students used email or chat at least once per day and 22 per cent searched the internet for non-study information at least once per day.

In the group of entertainment applications the most frequently used were listening to music or watching DVDs (24 per cent of students did this at least once a day) and playing games (18 per cent of students did this at least once each day).

In the group of school utilities the most frequently used applications were searching the Internet for information for study or school work and using word processing software to write documents. These applications were used at least once each day by 11 and nine per cent of students respectively.

Table 5.6: Frequency of Use of Various Computer Applications for Year 6 and Year 10 in 2008

	Frequency Category					
	Never	Less than monthly	Weekly to monthly	Few times per week	Almost every day	At least once each day
School utilities						
search the Internet for information for study or school work	2.5	6.0	18.6	42.5	19.6	10.7
use word processing software to write documents	5.2	8.2	23.1	37.5	17.1	8.9
use spreadsheets	33.6	29.1	22.1	9.9	3.1	2.2
use mathematics, language or other learning programs on a computer	35.7	23.3	17.6	13.1	5.7	4.6
Entertainment						
download games and/or other software applications from the Internet	27.0	20.5	20.9	16.7	7.5	7.4
download or stream music and/or podcasts from the Internet	21.1	11.1	15.7	23.1	15.7	13.2
play games on a computer	7.9	11.1	16.3	28.3	18.6	17.7
use software to create sounds/ music, movies or animations	30.7	19.2	19.1	14.9	8.7	7.4
use a computer to listen to music or watch DVDs	8.9	11.1	14.3	22.0	19.6	24.1
play multiplayer games over the Internet	42.6	14.7	10.7	12.3	8.5	11.1
Social Communication						
search the Internet for information that is not for study or school work	4.5	6.9	13.5	29.6	23.3	22.0
use a computer for email or “chatting”	12.8	6.5	8.1	20.1	22.7	29.8
write or reply to blogs or forum threads	42.7	11.3	12.1	14.1	10.7	9.3
upload text, images or video to an online profile	31.4	13.1	15.9	16.7	11.3	11.5
use voice chat (VOIP) to communicate with friends online	58.9	10.7	8.4	8.6	6.5	6.9
store digital photos on a computer	14.9	16.6	25.8	23.4	10.1	9.2
Computer technology						
write computer programs or macros	72.1	9.6	6.7	6.0	2.5	3.1
upload media you have created to the Internet for others to enjoy	62.4	12.1	9.0	7.5	4.6	4.3
construct websites	70.8	13.0	6.2	4.6	2.9	2.6
use drawing, painting or graphics programs on a computer	19.3	20.4	21.0	20.1	9.8	9.4

Comparing use by groups of students

In order to compare the use of different types of applications by different groups a set of four scales corresponding to the categories above were derived. Item response theory was used to derive the scales and scores were recorded as weighted likelihood estimates. The scales were anchored by setting the mean score for Year 6 students at zero with a standard deviation of one for each of the four scales. The reliability of the scale scores ranged from 0.70 to 0.80. Scale scores are recorded in Table 5.7. Negative scores indicate that the group used computers less frequently than the Year 6 average for that scale and positive scores that the group used computers more frequently than the Year 6 average for that scale. The magnitudes of the scores (positive or negative) also increase as the difference from the mean increases.

From Table 5.7 it can be seen that in Year 6 and Year 10 female students use computers for social communication more frequently and for entertainment less frequently, than do males. In Year 6, but not in Year 10, females use computer school utility applications more frequently than males (in Year 10 there is no difference). In Year 10, but not in Year 6, females use computer technology applications less frequently than males. Overall students in Year 10 use computers much more frequently for social communication, somewhat more frequently for entertainment and just a little more frequently for school utilities. In Year 10 students use computer technology applications less frequently than do students in Year 6 (mainly associated with less frequent use of drawing, painting or graphics applications).

Table 5.7: Indicators of Use of Categories of Computer Applications for Year 6 and Year 10 Male and Female Students in 2008

	Male		Female		All Students		Significance of Difference	
	Mean	Conf. Interval	Mean	Conf. Interval	Mean	Conf. Interval	Sex	Yr 10 cf. Yr 6
Year 6 Students								
Social communication	-0.05	±0.06	0.05	±0.05	0.00	±0.04	Yes	
Entertainment use	0.13	±0.06	-0.14	±0.05	0.00	±0.04	Yes	
School utilities	-0.09	±0.06	0.10	±0.05	0.00	±0.05	Yes	
Computer technology	-0.01	±0.06	0.01	±0.05	0.00	±0.04	No	
Year 10 Students								
Social communication	0.44	±0.04	0.54	±0.03	0.49	±0.03	Yes	Yes
Entertainment use	0.39	±0.05	-0.15	±0.04	0.12	±0.03	Yes	Yes
School utilities	0.11	±0.05	0.08	±0.04	0.09	±0.04	No	Yes
Computer technology	-0.12	±0.05	-0.27	±0.05	-0.20	±0.04	Yes	Yes

Interest in Computers

Students responded to seven questions about their interest in computing. These seven items formed one dimension and the scale based on them had reliability coefficients of 0.72 in Year 6 and 0.77 in Year 10. The items are shown in Table 5.8 together with the overall distribution of responses.

Overall response pattern

The items in Table 5.8 are ordered from those recording highest to lowest levels of agreement. It can be seen that the items cover a wide range of levels of agreement but with most items attracting agreement from more than half the students. The item that is most agreed with is that which states that "working with a computer is really fun" with 91 per cent of students either agreeing or strongly agreeing. The second most agreed with item is "it is very important to me to work with a computer" (83.5 per cent agreeing or strongly agreeing). The item that is least agreed with is that which states "when I am using a computer nothing else matters". Only 18 per cent of students agreed or strongly agreed with this item.

Table 5.8: Student Responses to Questions about Working with Computers in 2008

Item	Percentage of students in each category			
	Strongly disagree	Disagree	Agree	Strongly agree
I think playing or working with a computer is really fun.	1.6	7.1	52.6	38.6
Time goes quickly when I am using a computer.	4.1	15.3	45.8	34.8
It is very important to me to work with a computer.	2.1	14.4	55.9	27.6
I lose track of time when I am working with the computer.	6.1	23.2	39.7	31.0
I need a computer to help me do my work.	6.2	25.7	46.6	21.5
I use a computer because I am very interested in technology.	8.9	37.7	35.4	18.0
When I am using a computer nothing else matters.	33.2	49.0	11.1	6.7

Differences in student interest in computers among males and females at Year 6 and Year 10

The overall scale score of interest in computers was used to compare levels of interest among different groups of students. Item response theory was used to derive the scale and scores were recorded as weighted likelihood estimates. The scales were anchored by setting the mean score for Year 6 students at zero with a standard deviation of one. Scale scores are recorded in Table 5.9.

Table 5.9: Interest in Computers among Year 6 and Year 10 Students

	Year 6		Year 10		Sig. Diff. Yr 6 Yr 10
	Mean Score	Conf. Interval	Mean Score	Conf. Interval	
Males	0.07	±0.06	0.01	±0.05	No
Females	-0.07	±0.05	-0.15	±0.04	Yes
Significant difference male-female	Yes		Yes		

The data in Table 5.9 indicate that in both Year 6 and Year 10 males record stronger levels of interest in computing than do females. The difference is 0.14 of a standard deviation at each Year level which is conventionally taken as a small difference. To illustrate the magnitude of this difference consider the item that working with a computer is really fun. In Year 6 49 per cent of males and 41 per cent of females strongly agreed with this statement. In Year 10 the corresponding figures were 39 per cent and 27 per cent. For the item "it is very important to me to work with a computer" the figures were 25 per cent of males and 18 per cent of females at Year 6 and 38 per cent of males and 29 per cent of females in Year 10.

The other observation from Table 5.9 is that there is an overall interaction effect of sex and Year level. There is no difference in the interest in computers among males in Year 6 and Year 10 but there is a lower level of interest among females in Year 10 than females in Year 6. However the item that states "I need a computer to help me do my work" is supported to the same extent by males and females at both Year levels. In Year 6 23 per cent of males and 20 per cent of females strongly agreed with this statement. In Year 10 the corresponding figures were 21 per cent and 22 per cent. This item is the least good fit to the scale because it combines perceptions of utility as well as interest.

Familiarity with Computers and ICT Literacy

In Chapter 4 the influence of student characteristics and jurisdiction on student ICT literacy was examined, using multiple regression analysis. That analysis provides an indication of the net effect of each variable on ICT literacy scores, after allowing for the effects of associated variables. The analysis generates coefficients (B) that provide an indication of the net influences of the predictor or independent variables in the analysis on the dependent variable (student performance). The larger the (B) coefficient is, the stronger the effect of that variable is as a predictor on the dependent variable[10]. The analysis also indicates the percentage of the variance explained by the blocks of variables on ICT literacy. Greater detail about the procedure was provided in Chapter 4.

10 Confidence intervals are based on replication methods (specifically the Jack-knife method) so that they take account of the clustered sample structure as outlined in the previous chapter (see page 46).

In this chapter that analysis is extended by adding variables reflecting student familiarity with computers. These variables reflect the years of using a computer, indexes of the frequency of home and school computer use and interest in computers (using the scale described in the previous section of this chapter).

In the analysis student characteristics were entered as block one, items concerned with familiarity with computers were entered as block two and jurisdictional variables were entered as block three. This was done so that the influence of computer familiarity could be examined after allowing for the effects of student characteristics and so that the effects of jurisdictional differences could be examined net of differences in student background and familiarity with computers. The analyses are reported separately for Year 6 and Year 10 in Table 5.10.

The coefficients shown are those for the "full" or "complete" model. The percentage of variance explained by each block of variables is recorded for the sequence in which the blocks were included in the analysis.

For both Year 6 and Year 10 the set of variables included in these analyses accounted for 22 and 20 per cent respectively of the variance in student ICT literacy scores. This was almost the same as was reported for the 2005 assessment. It can be observed that student background accounts for 13 and ten per cent of the variance in ICT literacy scores in Year 6 and 10 respectively.

Familiarity with computers accounted for seven per cent of the variance in ICT literacy scores in Year 6 and nine per cent of the variance in ICT literacy scores in Year 10. Jurisdictional differences accounted for only a small percentage of the variance in ICT literacy scores because there was considerable variation within each jurisdiction.

Table 5.10: Results of Regression Analysis of ICT Literacy on Student Background, Computer Familiarity and Jurisdiction

Predictor	Year 6 Students			Year 10 Students		
	Regression Coefficient (B)	Conf. Interval	Incremental Variance Explained (R squared)	Regression Coefficient	Conf. Interval	Incremental Variance Explained (R squared)
Intercept						
b0	**293.2**	19.7		**404.5**	23.4	
Block 1 Student background			12.8%			10.3%
Age (relative to mean age)	**-12.8**	10.0		**-24.8**	8.9	
Sex (female 1, male 0)	**15.0**	8.1		**17.0**	8.3	
Indigenous (coded 1, 0)	**-58.0**	15.2		**-65.0**	25.9	
Language other than English (coded 1, 0)	-0.1	11.3		**-14.4**	11.4	
Senior managers & professionals	**67.6**	10.4		**45.8**	11.2	
Managers & associate professionals	**55.9**	12.0		**28.5**	12.5	
Tradespeople, skilled office, sales service	**27.6**	10.7		**15.0**	11.3	
Provincial location	**-23.4**	10.9		-9.0	11.4	
Remote location	**-45.5**	39.2		**-30.9**	18.7	
Block 2 Computer familiarity			7.4%			9.1%
Computer experience	**13.1**	2.6		**17.0**	2.9	
Home usage	**1.1**	0.5		**1.4**	0.6	
School usage	**-1.1**	0.6		0.3	0.4	
Application: utilities	**5.7**	4.1		**8.3**	5.3	
Application: entertainment	-2.8	5.6		3.8	5.3	
Application: social comm.	**5.5**	4.7		**-14.1**	7.0	
Application: technology	**-17.3**	4.3		1.0	4.7	
Interest in computers	**9.0**	4.2		**4.1**	4.0	
Block 3 Jurisdiction (compared to Queensland)			1.8%			1.0%
New South Wales	**22.7**	13.0		**27.9**	15.6	
Victoria	**47.6**	17.0		**30.5**	15.4	
South Australia	**40.1**	14.6		10.4	13.9	
Western Australia	9.4	11.8		6.3	15.5	
Tasmania	**34.8**	18.2		12.6	19.0	
Northern Territory	19.3	31.4		-13.1	35.2	
Australian Capital Territory	**52.0**	17.3		**40.9**	17.5	
Full model			21.9%			20.3%

Notes: 1) Coefficients in bold are statistically significant at the .05 level.
2) When categorical variables involving more than two categories are included in a regression analysis it is necessary to designate one category as the reference category and exclude that from the analysis so that results are relative to the reference category. In these analyses the reference category for socioeconomic group was unskilled labourers, office, sales and service staff, for location the reference category was "metropolitan" and for jurisdiction the reference category was Queensland.

The better performance of females compared to males is evident despite the higher levels of use of, and stronger interest in, computers by males. This difference can be partly interpreted in terms of the differences in the nature of computer use by males and females. Males use computers for entertainment more frequently than females (especially in Year 10) and this may not necessarily develop information literacy. However, the results of the regression analysis show that the differences in ICT literacy between females and males remain even making a statistical allowance for the effects of difference in use. This is consistent with the argument advanced in the report of the 2005 cycle (MCEETYA, 2007: 94) that the development of ICT literacy does not simply result from using computers but requires systematic teaching about how the ICT medium can be applied to support communication.

Among the student background characteristics the strongest influence on ICT literacy was socioeconomic background. The net difference between the average ICT literacy scores of Year 6 students whose parental occupational group was classified as "unskilled manual, office and sales" and students whose parental occupational group was "senior manager or professional" was 68 scale points. In Year 10 the corresponding difference was a little less, being just 46 scale points.

The net difference between Indigenous and non-Indigenous students was approximately 58 scale points at Year 6 and 65 scale points at Year 10. There was also a net difference between students in remote geographic locations and those in metropolitan locations with the gap being between 46 (Year 6) and 31 (Year 10) scale points. In Year 6 there was a net difference of 23 scale points between metropolitan and provincial locations but in Year 10 this difference was not statistically significant. Females scored higher than males by approximately 15 scale points at Year 6 and 17 scale points at Year 10.

Computer experience (time for which the student has been using computers) had a significant and positive effect on ICT literacy as does the frequency of use of computers at home. Each extra day per month contributes about one scale point so that the net difference in ICT literacy score associated with someone who used a computer at home at least once per day and someone who used a computer at once per month would be expected to be between 33 and 42 scale points. The net effect of school usage was not significant in Year 10 and negative in Year 6 but this was net of other factors including home usage. Frequency of use of school utilities was associated with higher ICT literacy scores at both Year 6 and Year 10. However, use of computers for social communication was positive in Year 6 but strongly negative for Year 10. Interest in computers was significantly and positively associated with higher ICT literacy scores at both Year 6 and Year 10.

Summary

Although there are differences in the extent to which students in Years 6 and 10 use computers it is evident that there has been an increase in home and school computer usage between 2005 and 2008. There are differences in home usage, but not school usage, among geographic locations for both Year 6 and Year 10 and among socioeconomic groups in Year 10. It is also evident that students vary in the computer applications that they use. Those patterns of use differ between Year 6 and Year 10, and between males and females. Social communication is a frequent use at both Year 6 and Year 10 and using the internet to look up information is also a frequent application at both Year levels. School utilities are also used by students with moderate frequency. Furthermore these differences appear to be associated with differences in ICT literacy scores and contribute to some of the variations in ICT literacy among students. There is an argument that reducing the variations in ICT literacy among school students will require some attention to differences in familiarity and therefore in access to computers as well as systematic learning about information management.

Chapter 6
Conclusion

Australian education systems have supported the application of ICT in education through a number of initiatives. These have included the establishment of Education Network Australia and related activities through "education.au", the development of digital learning objects for use in schools through The Learning Federation and the enhancement of computing resources and connectivity through the Digital Education Revolution. The *National Goals for Schooling in the Twenty-First Century* adopted in 1999 stated that when students leave school they should 'be confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society' (MCEETYA 1999). This was re-iterated in the *Declaration on Educational Goals for Young Australians* which asserted that "in this digital age young people need to be highly skilled in the use of ICT" (MCEETYA, 2008).

The National Assessment Program is designed to monitor the extent to which students are achieving national goals. Those goals that are concerned with ICT are monitored through a series of triennial sample assessment surveys. In 2005, the first of these sample assessment surveys established baseline levels of achievement in ICT Literacy among students in Year 6 and Year 10. This second survey in 2008 investigated whether there had been a change in the extent to which these goals had been achieved over three years.

Defining ICT Literacy

The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) defined ICT Literacy as the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society (MCEETYA, 2007). The framework that elaborated this definition referred to six key processes in ICT Literacy: accessing information; managing information; evaluating information; developing new understandings; communicating; and using ICT appropriately. Progress was envisaged in terms of levels of increasing complexity and sophistication in three strands of ICT use: working with information; creating and sharing information; and using ICT responsibly. This view of ICT literacy emphasised the interaction of information literacy with computer technology. Since 2005 ICT literacy has become increasingly regarded as a broad set of generalisable and transferable capabilities that are used to manage and communicate cross-disciplinary information. The integration of information and technology is seen to transcend the application of ICT within any single learning discipline (Markauskaite, 2007). According to Catts and Lau (2008) "people can be information literate in the absence of ICT, but the volume and variable quality of digital information, and its role in knowledge societies, has highlighted the need for all people to achieve information literacy skills".

Assessing ICT Literacy

Authenticity

A key aspect of the assessment of ICT literacy in Australia has been that it is designed as an authentic performance assessment. In 2005 Australia implemented a computer-based assessment of ICT literacy and this approach was continued in the second cycle in 2008. The assessment instrument was designed to mirror students' typical 'real world' use of ICT. Students completed tasks on computers using software that included a seamless combination of simulated and live applications. Some tasks were automatically scored and others (those that resulted in information products) were stored and marked by human assessors. The tasks (items) were grouped in thematically linked modules each of which followed a narrative sequence covering a range of school-based and out-of-school based themes. Each module typically involved students collecting and appraising information as well as synthesising and reframing the information. The assessment involved a number of modules so as to ensure that the assessment instrument accessed what was common to the ICT Literacy construct across a sufficient breadth of contexts.

The ICT literacy scale

Describing the ICT literacy scale involved a detailed analysis of the skills and knowledge required to achieve each score level on each task. Each was then used to generate a description of the ICT literacy scale. At the bottom level student performance was described in terms of performing basic tasks using computers and software, implementing the most commonly used file management and software commands when instructed and recognising commonly used ICT terminology and functions. At the middle level student performance involved generating simple general search questions and selecting the best information source for a purpose, retrieving information from given electronic sources to answer specific, concrete questions, assembling information in a simple linear order to create information products and using conventionally recognized software commands to edit and reformat information products. At the second top level student work was described in terms of evaluating the credibility of information from electronic sources and selecting the most relevant information to use for a specific purpose, creating information products that show evidence of planning and technical competence, using software features to reshape and present information graphically consistent with presentation conventions and designing information products that combine different elements and accurately represent their source data.

Assessing change

For a long time one of the foundation principles of assessing change had been "when measuring change do not change the measure" (Beaton & Johnson, 1990). However, changes in assessment methodologies and content are necessary for assessments to stay relevant (von Davier & Mazzeo, 2009). For that reason modern approaches to the assessment of trends keep part of an assessment common from one cycle to the next and introduce new material to other parts of the assessment. The common elements are used to equate the measurements of the old and new assessments and the new material is used to ensure that changes in the domain are reflected in the assessment. This is especially important in the assessment of ICT literacy where changes in the domain might be expected.

Two cycles of assessment in ICT literacy

The format of the ICT literacy assessment in 2008 was the same as in 2005 in that the appearance of material was identical and the method of responding to tasks and saving information products was exactly the same. The assessment instrument used in 2008 was linked to that used in 2005 by the inclusion of three common modules including the general skills test (completed by all students in both cycles), photo album and DVD day (each student completed one of these). These three common modules covered different aspects of the 2005 assessment (general skills, a piece of unfamiliar software and using common utilities).

The assessment in 2008 included four new modules. The new modules included tasks associated with more interactive forms of communication and assessed issues involving responsible use of ICT more extensively than 2005. The new modules were *Friends PC, School Survey, Sports Picnic* and *Internet Use*. Each student completed two of these modules. In addition the applications functions in these modules were based on Open Office rather than MS Office to provide a basis for a transition to Open Office in the third assessment cycle. There was also a change in delivery mode to make more use of school computers but this was accomplished in a way that would not have affected the student's experience of the assessment.

Changes in Performance from 2005 to 2008

There was a statistically significant increase in the mean score for Year 6 students between 2005 and 2008 from 400 to 419 scale points. Given a standard deviation of 100 points this would be characterised as a small increase in conventional terminology. For Year 10 the increase from 551 to 560 scale points was not statistically significant. The change from 2005 to 2008 can also be expressed in terms of the percentage of students who attained the proficient standard. In 2008 57 per cent of Year 6 students reached or exceeded the Year 6 proficient standard compared to 49 per cent in 2005. Correspondingly, 66 per cent of Year 10 students in 2008 reached or exceeded the Year 10 proficient standard compared to 61 per cent in 2005. The Year 6 change was statistically significant but the Year 10 change was not.

Computer Use at Home and School

Over the period from 2005 there was an increase in the use of computers at home and at school. In 2008 54 per cent of Year 6 students and 73 per cent of Year 10 students used a computer at home almost every day or more frequently. In 2005 the corresponding figures were 43 per cent and 58 per cent (MCEETYA, 2007: 64). There was also an increase in school computer usage almost every day or more frequently. In Year 6 the increase in "daily" use between 2005 and 2008 was from 14 to 21 per cent and in Year 10 the increase was from 18 to 32 per cent. This increase in computer usage may well be the reason for the increased level of ICT literacy although there may have also been a change in the ways in which students are taught to use computers.

The analysis of the 2008 survey indicated that home usage (and experience in using computers) was associated with higher ICT literacy scores in Year 6 and Year 10. However, it was the use of school utilities that was positively associated with ICT literacy. Use for social communication in Year 10 and technology applications in Year 6 had net negative associations with ICT literacy and entertainment use had no association with ICT literacy at all.

In addition there was an association between interest in computers and ICT literacy. Students who were favourably disposed to working with computers attained higher levels of ICT literacy. Of course, the direction of causation is far from clear. It could be that enjoying working with computers results in higher levels of ICT literacy or it could be that higher levels of ICT literacy make working with computers more enjoyable.

Social and Demographic Factors Associated with ICT Literacy

Student background characteristics are related to ICT literacy and the patterns are similar in Year 6 and Year 10. The largest effects are associated with socioeconomic background. In Year 6, 41 per cent of students whose parents were from the "unskilled manual, office and sales" occupational groups attain the proficient standard compared to 72 per cent of students whose parents are from the "senior managers and professionals" occupational group. In Year 10 the corresponding figures are 52 per cent and 78 per cent. These differences are similar to the differences reported in 2005 and they are partly, but not entirely, associated with differences in students' experience and frequency of using computers.

There is a substantial gap in the ICT literacy of Indigenous and non-Indigenous students. In Year 6, 24 per cent of Indigenous students attained the proficient standard compared to 59 per cent of non-Indigenous students. At Year 10, the corresponding percentages were 32 per cent and 68 per cent. The gap in ICT literacy achievement between Indigenous and non-Indigenous students is greater in 2008 than it was in 2005.

There was also evidence of differences in ICT literacy among geographic locations. At both Year 6 and Year 10 the tendency was for metropolitan students to record higher ICT literacy scores than students in provincial areas who, in turn recorded higher scores than those in remote areas. The percentages of Year 6 students attaining the proficient standard were 61, 48 and 38 per cent for metropolitan, provincial and remote respectively. The percentages of Year 10 students attaining the proficient standard for metropolitan, provincial and remote locations were 69, 62 and 45 per cent. The differences between percentages attained for each geographic location are very similar to those reported from the 2005 survey.

Females recorded higher levels of ICT literacy than males and this is consistent with the tendency observed in 2005. There were no differences at all between students for whom a language other than English was mainly spoken and other students.

Differences among Jurisdictions

At Year 6, there were differences among jurisdictions in ICT literacy. The mean score for the Australian Capital Territory was significantly higher than those for all other jurisdictions and the mean scores for Victoria and South Australia were significantly higher than the means for the remaining jurisdictions. The mean score for New South Wales was not significantly different from the means for Tasmania or Western Australia but it was significantly higher than the mean score for Queensland. The mean score for the Northern Territory was substantially lower than the next lowest jurisdictional score but this did not appear as significant because of the large confidence interval associated with the estimate for the Northern Territory. At Year 6 the jurisdictions in which the highest percentages attained the proficient standard were the Australian Capital Territory (75 per cent) and Victoria (66 per cent) and the jurisdictions where the lowest percentages attained the proficient standard were the Northern Territory (42 per cent) and Queensland (48 per cent).

In Year 10 fewer of the differences between jurisdictions were statistically significant than was the case at Year 6. The mean score for the Australian Capital Territory was significantly higher than those for all other jurisdictions. The mean scores for Victoria, New South Wales, South Australia, Western Australia and Queensland were not significantly different from each other and the mean score for Tasmania was lower than the mean scores for all jurisdictions except the Northern Territory. The mean score for the Northern Territory was substantially lower than the next lowest jurisdictional score but this does not appear as significant because of the large confidence interval associated with the estimate for the Northern Territory. At Year 10 the jurisdictions in which the highest percentages attained the proficient standard were the Australian Capital Territory (77 per cent) and Victoria (70 per cent) and the jurisdictions where the lowest percentages attained the proficient standard were the Northern Territory (46 per cent) and Tasmania (58 per cent).

Summary

From 2005 to 2008 there was a definite improvement in the ICT literacy of Year 6 students and a less certain tendency towards improvement in ICT literacy across Year 10 students. Overall, 57 per cent of Year 6 students attained the proficient standard for that Year level by being able to: “generate simple general search questions and select the best information source to meet a specific purpose, retrieve information from given electronic sources to answer specific, concrete questions, assemble information in a provided simple linear order to create information products, use conventionally recognised software commands to edit and reformat information products”. Sixty-six per cent of Year 10 students reached or exceeded the proficient standard for Year 10 by indicating that they were able to: “generate well targeted searches for electronic information

sources and select relevant information from within sources to meet a specific purpose, create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose".

There are substantial differences in skills displayed between Year 6 and Year 10 students suggesting that considerable growth in ICT proficiency takes place over these four years. However, there remains variation among students in ICT literacy. Many students use ICT in a relatively limited way and this is reflected in their overall level of ICT literacy. There are differences associated with socioeconomic background, Indigenous status and remote geographic locations that deserve attention.

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Appendix 1
Sample characteristics

Table A1: National Percentage Distribution of Sample Characteristics (Weighted)

	Year 6		Year 10	
	%	Valid %	%	Valid %
Student Sex				
Boy	50.7	50.9	49.6	50.2
Girl	48.9	49.1	49.2	49.8
Total	99.6	100.0	98.8	100.0
Missing	0.4		1.2	
Parental occupation				
Senior managers & professionals	24.9	26.2	28.4	29.8
Other managers associate professionals	18.9	19.9	22.2	23.3
Skilled trades, clerical & sales	31.0	32.6	30.0	31.5
Unskilled manual, office & sales	20.3	21.3	14.7	15.4
Total valid responses	95.2	100.0	95.4	100.0
Not in paid work for 12 months	0.9		0.6	
Missing	3.9		4.0	
Indigenous Status				
Non Aboriginal or Torres Strait Islander	93.2	93.5	94.6	95.7
Aboriginal or Torres Strait Islander	6.4	6.5	5.2	4.3
Total	99.6	100.0	98.8	100.0
Missing	0.4		1.2	
Language at home				
English	73.4	73.9	73.8	74.8
Other than English	26.0	26.1	24.9	25.2
Total	99.4	100.0	98.7	100.0
Missing	0.6		1.3	
Main Language - Country of birth				
English (including Australia)	90.3	90.7	86.2	87.4
Other than English	9.2	9.3	12.5	12.6
Total	99.5	100.0	98.7	100.0
Missing	0.5		1.3	
Geographic location				
metropolitan	70.5	71.8	69.5	70.9
provincial	26.7	27.2	27.2	27.7
remote	1.0	1.0	1.3	1.3
Total	98.1	100.0	98.0	100.0
Missing	1.9		2.0	
Number of Students		5,604		5,322

Table A2: Percentage Distribution of Year 6 Sample Characteristics for Jurisdictions

	Jurisdiction							
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Student Sex								*(a)*
Boy	50.5	53.2	47.9	50.9	56.2	45.4	47.2	40.6
Girl	49.1	46.8	51.1	49.0	43.7	54.8	50.7	59.1
Missing	0.4	0.0	1.1	0.1	0.1	0.0	2.1	0.3
Parental occupation								
Senior managers & professionals	25.0	28.2	21.4	22.7	25.9	21.6	19.1	35.0
Other managers associate professionals	17.0	21.1	20.6	18.4	16.5	16.0	16.1	21.5
Skilled trades, clerical & sales	30.0	29.0	31.2	36.2	35.1	33.8	37.9	32.8
Unskilled manual, office & sales	21.7	18.7	21.4	19.0	19.1	23.9	20.4	8.3
Not in paid work for 12 months	0.9	0.6	0.9	1.2	0.9	1.0	0.9	0.3
Missing	5.3	2.4	4.5	2.5	2.5	3.7	5.5	2.1
Indigenous Status								
Non Aboriginal or Torres Strait Islander	92.0	97.5	90.2	95.6	93.7	88.4	74.3	96.2
Aboriginal or Torres Strait Islander	7.6	2.5	8.7	4.3	6.2	11.6	23.6	3.5
Missing	0.4	0.0	1.1	0.1	0.1	0.0	2.1	0.3
Language at home								
English	68.0	68.4	83.4	75.9	77.8	90.9	81.2	74.2
Other than English	31.5	31.5	15.2	23.9	22.1	9.1	16.7	25.5
Missing	0.5	0.1	1.4	0.2	0.1	0.0	2.1	0.3
Main Language - Country of birth								
English (including Australia)	91.3	91.9	87.5	91.7	84.1	96.3	90.8	90.1
Other than English	8.1	8.1	11.4	7.9	15.8	3.5	7.1	9.6
Missing	0.5	0.0	1.1	0.3	0.1	0.2	2.1	0.3
Geographic location								
Metropolitan	73.1	72.7	67.4	70.2	73.9	46.1	0.0	94.9
Provincial	25.1	26.8	28.8	25.1	21.0	51.0	55.2	3.1
Remote	0.2	0.0	2.9	2.4	3.8	0.2	41.4	0.3
Missing	1.6	0.5	1.0	2.3	1.3	2.7	3.4	1.7
Number of students	842	898	949	865	849	533	326	342

Notes a) ACT sample included by chance one all girls school

Table A3: Percentage Distribution of Year 10 Sample Characteristics for Jurisdictions

	Jurisdiction							
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT
Student Sex								
Boy	46.1	54.0	49.0	52.4	48.5	49.3	55.5	49.8
Girl	51.8	44.2	50.8	47.0	51.2	50.5	43.7	49.9
Missing	2.1	1.7	0.3	0.6	0.4	0.1	0.8	0.3
Parental occupation								
Senior managers & professionals	29.6	31.5	22.9	27.0	29.5	27.9	22.4	38.8
Other managers associate professionals	22.0	22.5	22.8	21.6	21.6	18.9	18.2	28.6
Skilled trades, clerical & sales	28.4	30.2	33.1	31.0	27.9	31.7	31.0	23.8
Unskilled manual, office & sales	14.1	10.6	18.2	15.8	18.3	18.3	15.4	6.8
Not in paid work for 12 months	0.6	0.5	0.8	0.8	0.5	0.7	3.0	0.9
Missing	5.2	4.7	2.3	4.5	2.2	2.6	10.0	1.1
Indigenous Status								
Non Aboriginal or Torres Strait Islander	93.6	96.5	93.6	96.8	96.2	92.8	68.2	96.6
Aboriginal or Torres Strait Islander	4.3	1.8	6.2	2.6	3.4	7.1	31.1	3.1
Missing	2.1	1.7	0.3	0.6	0.4	0.1	0.8	0.3
Language at home								
English	70.4	68.0	80.3	77.5	77.9	90.7	68.2	73.5
Other than English	27.5	30.1	19.4	21.8	21.7	9.0	30.6	26.2
Missing	2.1	2.0	0.3	0.7	0.4	0.3	1.2	0.3
Main Language - Country of birth								
English (including Australia)	85.8	87.1	85.3	89.2	83.6	92.4	86.2	86.5
Other than English	12.0	11.1	14.4	10.1	15.8	7.3	12.7	13.2
Missing	2.2	1.8	0.3	0.7	0.4	0.3	1.1	0.3
Geographic location								
Metropolitan	71.8	69.5	68.9	70.7	72.1	36.9	0.0	98.1
Provincial	25.5	28.2	29.4	25.3	20.0	60.4	62.7	1.1
Remote	0.1	0.0	0.7	2.2	6.3	0.2	34.3	0.0
Missing	2.6	2.3	0.9	1.8	1.6	2.5	0.2	0.9
Number of students	895	850	884	836	805	545	189	318

Appendix 2
ICT literacy scale descriptors and examples

Level	Proficiency level description	Examples of student achievement at this level
6	Students working at level 6 create information products that show evidence of technical proficiency, and careful planning and review. They use software features to organise information and to synthesise and represent data as integrated complete information products. They design information products consistent with the conventions of specific communication modes and audiences and use available software features to enhance the communicative effect of their work.	• create an information product in which the flow of information is clear, logical and integrated to make the product unified and complete. • select appropriate key points and data from available resources and use their own words to include and explicate them in an information product. • use graphics and text software editing features such as font formats, colour, animations and page transitions, in ways that enhance the structure and communicative purpose of an information product. • include relevant tables and charts to enhance an information product and support these representations of data with text that clearly explains their purpose and contents.
5	Students working at level 5 evaluate the credibility of information from electronic sources and select the most relevant information to use for a specific communicative purpose. They create information products that show evidence of planning and technical competence. They use software features to reshape and present information graphically consistent with presentation conventions. They design information products that combine different elements and accurately represent their source data. They use available software features to enhance the appearance of their information products.	• create an information product in which the information flow is clear and logical and the tone and style are consistent and appropriate to a specified audience. • select and include information from electronic resources in an information product to suit an explicit communicative purpose. • use graphics and text software editing features such as font formats, colour and animations consistently within an information product to suit a specified audience. • create tables and charts that accurately represent data and include them in an information product with text that refers to their contents. • apply specialised software and file management functions such as using the history function on a web-browser to return to a previously visited page or sorting data in a spreadsheet according to a specified criterion.

Level	Proficiency level description	Examples of student achievement at this level
4	Students working at level 4 generate well targeted searches for electronic information sources and select relevant information from within sources to meet a specific purpose. They create information products with simple linear structures and use software commands to edit and reformat information products in ways that demonstrate some consideration of audience and communicative purpose. They recognise situations in which ICT misuse may occur and explain how specific protocols can prevent this.	• create an information product in which the flow of information is clear and the tone is controlled to suit a specified audience. • generate searches that target relevant resources and then select relevant sections of these resources to include, with some modification and supporting text, in an information product. • apply graphics and text software editing features such as, font formats, colour and image placement consistently across a simple information product. • apply infrequently used software and file management functions such as displaying a specified hidden toolbar in a word processor, edit text in an online survey, or using a single pull-down menu function or installation wizard to save files to a specified location. • identify security risks associated with spyware and providing personal data over the internet and explain the importance of respecting and protecting the intellectual property rights of authors.
3	Students working at level 3 generate simple general search questions and select the best information source to meet a specific purpose. They retrieve information from given electronic sources to answer specific, concrete questions. They assemble information in a provided simple linear order to create information products. They use conventionally recognised software commands to edit and reformat information products. They recognise common examples in which ICT misuse may occur and suggest ways of avoiding them.	• create an information product that follows a prescribed explicit structure. • select clear, simple, relevant information from given information sources and include it in an information product. • use graphics and text software editing features to manipulate aspects such as colour, image size and placement in simple information products. • apply software and file management functions using common conventions such as left aligning selected text, adding questions to an online survey, or creating and naming a new file on the desktop. • recognise the potential for ICT misuse such as plagiarism, computer viruses, and deliberate identity concealment and suggest measures to protect against them.

Level	Proficiency level description	Examples of student achievement at this level
2	Students working at level 2 locate simple, explicit information from within a given electronic source. They add content to and make simple changes to existing information products when instructed. They edit information products to create products that show limited consistency of design and information management. They recognise and identify basic ICT electronic security and health and safety usage issues and practices.	• locate explicit relevant information or links to information from within a web-page. • make changes to some presentation elements in an information product. • apply simple software and file management functions such as, copying and pasting information from one column of a spreadsheet to another column or adding a web-page to a list of favourites (bookmarks) in a web-browser or opening an email attachment. • recognise common computer use conventions and practices such as the use of the '.edu' suffix in the URL of a school's website, the need to keep virus protection software up-to-date and the need to maintain good posture when using a computer.
1	Students working at level 1 perform basic tasks using computers and software. They implement the most commonly used file management and software commands when instructed. They recognise the most commonly used ICT terminology and functions.	• apply graphics manipulation software features such as adding and moving predefined shapes to reproduce the basic attributes of a simple image. • apply basic file and computer management functions such as opening and dragging-and dropping files on the desktop. • apply generic software commands such as the 'save as' and 'paste' function, clicking on a hyperlink to go to a webpage, or selecting all the text on a page. • recognise basic computer use conventions such as identifying the main parts of a computer and that the 'shut-down' command is a safe way to turn off a computer.

Appendix 3
Distribution of student scores over proficiency levels by jurisdiction

Table A4: Percentage Distribution of Year 6 Students over Proficiency Levels by Jurisdiction

	Level 1		Level 2		Level 3		Level 4 & above	
	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval
2008								
NSW	13.6	±3.9	31.9	±4.0	39.9	±5.2	14.6	±3.1
VIC	7.4	±2.7	26.6	±5.4	43.9	±4.5	22.1	±5.0
QLD	18.8	±3.9	32.9	±3.7	37.8	±5.0	10.4	±2.4
SA	9.7	±2.7	25.8	±4.2	43.6	±4.5	20.8	±4.1
WA	15.9	±3.5	33.4	±4.2	37.7	±3.7	13.0	±3.6
TAS	14.6	±4.6	33.8	±5.2	39.1	±6.5	12.5	±3.7
NT	25.2	±14.2	32.6	±9.2	31.8	±8.0	10.4	±4.6
ACT	5.2	±2.9a	19.7	±5.9	44.9	±7.3	30.2	±5.5
ALL	**13.0**	**±1.7**	**30.3**	**±2.1**	**40.6**	**±2.3**	**16.1**	**±1.7**
2005								
NSW	10.5	±3.3	39.1	±5.2	41.8	±6.0	8.7	±3.6
VIC	8.6	±3.8	33.6	±4.7	47.4	±4.5	10.4	±3.4
QLD	19.3	±4.8	43.0	±4.7	33.6	±4.8	4.1	±1.7
SA	10.4	±3.6	37.8	±5.7	42.7	±4.0	9.0	±3.7
WA	17.2	±4.7	43.1	±4.9	35.0	±5.3	4.6	±2.0
TAS	10.3	±5.1	40.8	±7.7	40.4	±8.4	8.4	±4.6
NT	24.2	±12.2	39.7	±11.5	33.3	±9.0	2.8	±2.6
ACT	8.5	±4.9	33.1	±11.4	45.5	±9.9	12.9	±7.0
ALL	**12.6**	**±1.5**	**38.8**	**±2.3**	**40.8**	**±2.7**	**7.8**	**±1.5**

Notes: (a) Estimate for Level 1 in the ACT is based on fewer than 30 cases and should be treated with extreme caution.

Table A5: Percentage Distribution of Year 10 Students over Proficiency Levels by Jurisdiction

	Level 2 & below		Level 3		Level 4		Level 5 & above	
	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval	Percent	Conf. Interval
2008								
NSW	7.9	±3.2	25.2	±4.1	46.2	±4.4	20.8	±4.7
VIC	8.2	±4.1	22.0	±4.2	46.7	±5.6	23.1	±4.7
QLD	9.7	±3.5	28.4	±5.2	47.4	±6.2	14.6	±4.3
SA	7.3	±2.7	28.1	±3.9	47.1	±4.8	17.5	±3.6
WA	7.2	±2.7	27.5	±5.0	48.7	±5.2	16.6	±3.7
TAS	12.2	±3.6	30.0	±6.1	43.7	±6.9	14.1	±4.4
NT	29.5	±16.3	24.7	±8.1	34.5	±13.3	11.3	±6.7a
ACT	4.5	±3.8a	18.4	±5.0	45.0	±9.6	32.1	±9.4
ALL	**8.5**	**±1.7**	**25.6**	**±2.2**	**46.7**	**±3.0**	**19.3**	**±2.4**
2005								
NSW	7.1	±2.5	31.8	±7.5	49.4	±6.4	11.7	±3.3
VIC	5.9	±1.9	27.6	±4.5	49.1	±5.0	17.4	±4.1
QLD	5.7	±2.8	34.8	±6.9	49.0	±8.1	10.6	±3.1
SA	6.1	±2.4	32.5	±4.1	49.4	±5.3	12.0	±3.6
WA	9.3	±4.2	34.9	±4.7	47.6	±5.6	8.2	±3.0
TAS	8.7	±4.2	35.0	±7.0	47.2	±5.3	9.1	±3.9
NT	14.4	±11.3	37.0	±8.1	40.9	±13.6	7.7	±5.9
ACT	4.0	±3.1	30.5	±12.5	47.5	±7.4	18.0	±8.7
ALL	**6.8**	**±1.2**	**32.0**	**±2.9**	**48.9**	**±2.7**	**12.3**	**±1.5**

Notes: (a)Estimates for Level 2 and below in the ACT and Level 5 and above in the NT, are based on fewer than 30 cases and should be treated with extreme caution.

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John Ainley from ACER was the project director of the project that resulted in this report. Chris Freeman was the project manager and Julian Fraillon was the assessment manager. This public report was written by John Ainley, Julian Fraillon and Chris Freeman. The test development team comprised Julian Fraillon, Mark Butler and Daniel Duckworth. The analysis team comprised Eveline Gebhardt, Rassoul Sadeghi and Wolfram Schulz with Renee Chow and Louise Wenn. The information technology team from ACER comprised Alisdair Daws, Daryl Nguyen, Jafaruddin Lie, Christophe Delcourt and Phoo Li Chan. The information technology consultants from SoNET Systems were Mike Janic and Stephen Birchall. The field operations team was led by Phillip Arthur and involved Anne Tierney-Roberts, Jennifer Babet, Warren Herbs and Vanessa Mealing.